



a global professional services company

creative thinking. **custom solutions.**®

1233 Silas Deane Highway | Wethersfield, Connecticut 06109 | Telephone 860-665-1140 | Fax 860-665-9445 | [www.ensafe.com](http://www.ensafe.com)

March 6, 2015

Guy Bobersky  
Division of Environmental Remediation  
NYS Department of Environmental Conservation  
625 Broadway — 11<sup>th</sup> Floor  
Albany, New York 12233-7015

Re: Frost Street Sites  
101 Frost Street Associates, LP [W1-0799-00-05] (Site Code #1-30-043I);  
Next Millennium Realty, LLC [W1-0799-00-05] (Site Code # 1-30-043L);  
Next Millennium Realty, LLC [W1-0893-01-07] (Site Code # 1-30-043M);  
Next Millennium Realty, LLC v. NYS Department of Environmental Conservation, Index  
No. 294-09 (Sup. Ct, Albany County) Clerk Doc # 10395184 (April 22, 2009)

Dear Mr. Bobersky:

In accordance with our discussions and on behalf of the referenced Respondents in these matters, enclosed please find the Respondents' Proposed Supplemental Investigation/Focused Feasibility Study Work Plan that is designed to develop the design for a final remedy for the groundwater at the Frost Street Sites in accordance with the Record of Decision for Operable Unit 02 — Combined Groundwater (March 2000). We look forward to your comments in support of the remedy.

Sincerely,

EnSafe Inc.

By: Rob McCarthy, P.E.  
Project Engineer

cc: Mr. Jeffrey Dyber, NYSDEC (three hard copies)  
Krista Anders, Ph.D., New York State Department of Health (two hard copies)  
Mr. Peter Scully, Director, Region 1, NYSDEC (one hard copy)  
Alali M. Tamuno, Esq., NYSDEC (one hard copy)  
Jennifer LaPaloma, U.S. EPA (electronic copy)

**SUPPLEMENTAL INVESTIGATION/FOCUSED FEASIBILITY  
STUDY WORK PLAN**

**FROST STREET SITES  
NYSDEC SITE NO. 1-30043 I, L, M  
WESTBURY, NEW YORK**

**EnSafe Project Number  
0888811027/PH10**

**Revision: 0**

**Prepared for:**

**Frost Street Parties  
Westbury, New York**

**Prepared by:**



**EnSafe Inc.  
5724 Summer Trees Drive  
Memphis, Tennessee 38134  
(901) 372-7962  
(800) 588-7962  
[www.ensafe.com](http://www.ensafe.com)**

**March 2015**

## PROFESSIONAL ENGINEER'S CERTIFICATION

In accordance with NYSDEC DER-10 Section 1.5 (b)1:

I, Robert McCarthy, certify that I am currently a NYS registered professional engineer and that this Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Signature

Robert McCarthy  
Printed Name



Date Signed

3/6/2015  
Project Engineer  
Title

It is a violation of New York State Education Law for any person, unless acting under the direction of a licensed professional engineer, to alter in any way plans, specifications, plates, and reports to which the seal of a professional engineer has been applied. If an item bearing the seal of an engineer or land surveyor is altered, the altering engineer shall seal the item and add the notation "altered by," sign and date such alteration, and provide a specific description of the alteration.

## Table of Contents

PROFESSIONAL ENGINEER'S CERTIFICATION .....	i
List of Acronyms .....	iv
EXECUTIVE SUMMARY.....	v
1.0 INTRODUCTION AND BACKGROUND .....	1-1
1.1 Work Plan Organization.....	1-1
1.2 Site Description and History.....	1-1
1.2.1 Basis for Remedy.....	1-1
1.2.2 GCW Design Efforts.....	1-2
1.2.3 Source Remedy .....	1-4
1.2.4 Depth of Frost Street Sites Release Contamination at Source Area .....	1-5
1.2.5 Downgradient Shallow Plume.....	1-5
1.2.6 Decreasing Concentrations with Time .....	1-7
1.2.7 Comprehensive Remedy .....	1-8
2.0 INVESTIGATION APPROACH .....	2-1
2.1 Sampling and Well Installation Scope .....	2-1
2.1.1 Initial Well Nests and Soil Sampling .....	2-1
2.1.2 Lateral Plume Delineation .....	2-1
2.2 Implementation .....	2-3
2.2.1 Soil Boring and Monitoring Well Installation.....	2-3
2.2.2 Groundwater Gauging and Sampling.....	2-4
2.2.3 Analytical Data Validation .....	2-4
2.2.4 Community Air Monitoring Plan .....	2-4
2.2.5 Decontamination.....	2-4
2.2.6 Investigation-Derived Wastes.....	2-6
2.2.7 Traffic Control .....	2-6
2.2.8 Restoration Plan .....	2-6
3.0 ENGINEERING EVALUATION/SUPPLEMENTAL REMEDY RECOMMENDATIONS.....	3-1
4.0 SCHEDULE.....	4-1
5.0 REFERENCES .....	5-1

## Figures

Figure 1	Sampling Location Map .....	2-2
----------	-----------------------------	-----

## Tables

Table 1	PCE Concentration Comparison .....	1-6
Table 2	Summary of Detected Compounds .....	1-7

## **Appendices**

Appendix A	Health and Safety Plan
Appendix B	Community Air Monitoring Plan
Appendix C	Quality Assurance Project Plan

## **List of Acronyms**

µg/L	micrograms per liter
AS	air sparging
bgs	below ground surface
CAMP	Community Air Monitoring Plan
FFS	Focused Feasibility Study
GCW	groundwater circulating wells
HASP	Health and Safety Plan
mg/L	milligrams per liter
NCIA	New Cassell Industrial Area
ND	non detect
NYSDEC	New York State Department of Environmental Conservation
OU	Operable Unit
PCE	tetrachloroethene
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
ROD	Record of Decision
SI	Supplemental Investigation
SVE	soil vapor extraction
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound

## EXECUTIVE SUMMARY

On behalf of Next Millennium Realty LLC and 101 Frost Street Associates, L.P. (collectively, the "Frost Street parties"), EnSafe submits this Supplemental Investigation/Focused Feasibility Study (FFS) Work Plan for the Frost Street Sites. Supplemental information is needed to refine and update the site characterization which led to the Operable Unit (OU) 2 Groundwater Record of Decision (ROD) (New York State Department of Environmental Conservation [NYSDEC] OU2 ROD, March 2000), and to provide a basis for design of a remedy that is consistent with OU2 ROD goals.

An air sparging/soil vapor extraction system was installed in 2006 and is currently operating to remediate the source area associated with NYSDEC Inactive Hazardous Waste Disposal sites 130043I, 130043L, and 130046M; collectively the Frost Street sites. Groundwater circulation wells were selected as the remedy in the OU2 ROD, and pre-design investigations in support of installation were conducted as a means of containing the apparent aqueous plume emanating from the source area and remediation of groundwater that has migrated past the current air sparging/soil vapor extraction system, which has established source control.

Supplemental investigation data and other information gathered since the ROD was developed has resulted in concern for the efficacy of moving forward with groundwater circulation wells; an engineering evaluation is also proposed to eliminate, to the extent practicable, offsite migration of groundwater that exceeds NYSDEC GA Ambient Water Quality Criteria (there is no current pathway for ingestion of groundwater at contaminant concentrations that do not attain New York State Department of Health Drinking Water Standards).

The groundwater remedy implemented should also complement and support the remedies to be implemented under the United States Environmental Protection Agency OU1 ROD. In an area immediately downgradient and south of Old Country Road, the U.S.EPA OU1 ROD calls for treatment of contaminated groundwater by hydraulic containment and in-situ oxidation, where the total chlorinated solvent concentration exceeds 100 micrograms per liter.

### Scope of Work

The scope of work for the Supplemental Investigation/Focused Feasibility Study includes:

- Environmental investigation — Installation of one soil boring to 150 feet below ground surface and eight nested monitoring wells with screened intervals every 10 feet from 70 to 150 feet below ground surface. Soil samples will be collected from the soil boring and analyzed for total volatile organic compounds. Groundwater samples will be collected from each monitoring well screened interval and from nearby wells.
- Additional investigation planning — As needed, an additional investigation will be proposed to further delineate the soil and/or groundwater contamination at selected depth intervals, east and west along Old Country Road, as determined with this initial investigation. This is expected to entail groundwater delineation, but if significant residual solvents are indicated to remain adsorbed to clay soil intervals, additional soil sampling will be proposed.

- Focused Feasibility Study — A FFS will be conducted and documented, which includes the results of the supplemental investigation phases discussed above, and recommendations, to the level of a remedial action plan, for implementing groundwater responses to meet the objectives of the site ROD.

**Schedule**

It is anticipated that the soil borings and wells can be installed in an approximately two week-long field effort, after a ten-week long review and contracting period, tentatively in the spring/summer of 2015. As needed, additional delineation would be initiated a month after analytical results are received, and within three months of completing field work a FFS and proposed action plan would be submitted for NYSDEC review and approval. Allowing for review and approval, the objective is to install a response action during the construction season in 2016.

## **1.0 INTRODUCTION AND BACKGROUND**

### **1.1 Work Plan Organization**

This work plan has been prepared in general accordance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10), dated May 3, 2010. The work plan has been organized as follows:

- Section 1.0 Introduction and Background
- Section 2.0 Investigative Approach
- Section 3.0 Supplemental Remedy Recommendations
- Section 4.0 References

### **1.2 Site Description and History**

The Operable Unit (OU) 2 Record of Decision (ROD) calls for installation of in-well stripping or groundwater circulating wells (GCWs) to address (i.e., intercept and restore) a groundwater plume of chlorinated solvent contamination before it flows to the south across Old Country Road. This remedy is based on data that is over 15 years old and predates several years of operation of the source area air sparging (AS)/soil vapor extraction (SVE) system, and the issuance of the United States Environmental Protection Agency (U.S. EPA) OU1 ROD which addresses the area to the south of Old Country Road and groundwater contamination originating from Frost Street and other sites. Accordingly, as discussed in detail below, there is a need to assess current conditions, augment design data, and coordinate and align efforts executed within the New Cassell Industrial Area (NCIA) with those that the U.S. EPA contemplates for installation a short distance downgradient.

#### **1.2.1 Basis for Remedy**

As noted in the OU2 ROD, groundwater contamination along the north side of Old Country Road was characterized during the Remedial Investigation (RI; Lawler, Matusky & Skelly Engineers, September 2000) at three hydro-punch and well locations. Total volatile organic compound (VOC) concentrations ranged up to about 1 milligram per liter (mg/L), mostly consisting of tetrachloroethene (common name perchloroethylene [PCE]), a relatively smaller fraction of trichloroethene (TCE), and 1,2-dichloroethenes. This detection was in a hydro-punch sample at 110 feet below ground surface (bgs) at FSHP-06, the central borehole among the three installed. These boreholes were converted to well pairs, with screened intervals near the top of groundwater and at 140 to 150 feet bgs.

A groundwater sample obtained from the corresponding deep interval (FSMW-06B at about 140 feet bgs), had a total VOC concentration of 239 micrograms per liter ( $\mu\text{g/L}$ ). Contamination levels observed in the two borings/wells to the east and west were lower, with no more than about 70  $\mu\text{g/L}$  PCE in a grab sample from 95 feet bgs in FSHP-05 to the east.

### **1.2.2 GCW Design Efforts**

The Frost Street Parties conducted pilot tests of GCW in 2007 and 2008, using a well pair (GCW-1A/B) that is about fifty feet east of FSMW-06B. Pilot testing included both vertical contaminant characterization (by direct push grab sampling) and aquifer testing. With test results, tentative spacing between GCW wells was calculated, and vertical contaminant profile borings were then advanced at two additional locations, GCW-2 and GCW-3, to a depth of about 150 feet bgs in July 2009. No wells were installed pending design approval and construction.

Contaminant concentrations measured in the GCW-1 vertical profile grab samples are generally consistent with those measured during the RI, with a maximum PCE concentration of less than 1 mg/L. However, at the GCW-2 location, PCE concentrations were elevated, ranging from 4 mg/L to 41 mg/L to a depth of 125 feet bgs, with maximum PCE concentrations between 95 and 115 feet bgs, below which concentrations attenuate. These levels of groundwater contamination by PCE are indicative either of a residual mass nearby or of a relatively concentrated plume that had already moved beyond the footprint of the AS/SVE system at the Frost Street source area by the time it was started. At GCW-3 the highest concentration was 5 mg/L tetrachloroethene at about 140 feet bgs, and is likely to be much lower today, which will be confirmed by sampling.

Not only were concentration levels much higher at GCW-2, but at both the GCW-2 and GCW-3 boreholes, the occurrence of layers of finer grained soil across this section was observed, through geophysical logging and by sieve analysis of soil sampled from selected intervals. Similar variability has been observed within this section of the upper Magothy formation during the RI, north and south of Old Country Road, pointing to a much higher anisotropy (i.e., the difference between horizontal and vertical hydraulic conductivity), as compared to the more homogeneous logs at GCW-1, which was the basis for the subsequently submitted remedial design.

Typically, anisotropy should be relatively low for GCW to be reliably protective and effective. Outside the GCW in the aquifer matrix, the intent is for water that enters the well at the lower screen to be partially treated and then recycled. Due to limitations regarding mass transfer in the commonly implemented in-well stripping systems, and depending on concentrations, water

that is drawn into the GCW may only partially be stripped of contaminants before it is injected back into the aquifer. This injection is accomplished by allowing water to exit an upper screen in the same well, ultimately to be circulated, conceptually along a path that would resemble a toroid around the well bore, and returned again in the lower well interval. Even discontinuous layers of much less permeable strata can interrupt this path of extra-well circulation to the point where the plume can in effect be dispersed by the GCW, not intercepted as intended.

In addition, well design and construction is complicated by a wide range of particle sizes across the interval. At the nearby General Instruments site interim action installation of GCW, fines intrusion shortened the life of one of the GCW installations, and may have adversely affected performance in the others.

These considerations have likely played a role in more recent remedial decisions. Just a short distance south of Old Country Road, NYSDEC chose not to implement GCW because of observations of fine grained layers and anisotropy similar to what we observed at the GCW-2 and GCW-3 locations. Dvirka and Bartilucci in their 2009 report of pre-design data collection for NYSDEC OU3, now U.S. EPA OU1, concluded that the alternate remedy of ex-situ groundwater pump and treat specified by the ROD be chosen in lieu of in-well air stripping, after discussing the site with several air stripping technology vendors. They further stated that, due to the technical limitations and logistical hurdles associated with the implementation of in-well air stripping technology, the alternate approach would be more effective at achieving ROD objectives. U.S. EPA came to the same conclusion in the OU1 ROD, selecting in-situ oxidation and groundwater extraction/hydraulic containment as the remedy for the eastern plumes south of Old Country Road, rather than GCW.

While anisotropy is lower at the GCW-1 location, pending confirmation of contaminant concentrations, this location may not be practicably addressed, given that lower concentration plume is to be managed by hydraulic containment or natural attenuation in the adjacent U.S. EPA OU1 area. To the west, near GCW-2, the intervals of finer grained soil generally coincide with the highest contamination levels found in grab sampling, which may be an indication of sorption of contamination, or a formation feature which in effects funnels contaminated groundwater that previously flowed past the Frost Street source areas.

The GCW-2 and GCW-3 boring logs and sieve analyses represent a significant departure from conditions that formed the basis for selecting GCW in the first place, and from the initial pre-design testing at GCW-1. Because of this, there are risks of failure associated with implementing GCW, especially in the vicinity of GCW-2 where elevated concentrations may persist.

### 1.2.3 Source Remedy

The Frost Street sites source area has since 2006 been actively treated by an AS/SVE system, installed on and around the western portion of the 89 Frost Street parcel. Based on monitoring since system startup, the following general observations can be made regarding AS/SVE operations to date:

- Aqueous phase contamination in groundwater that was emanating from the source area has been effectively controlled.
  - In the area immediately downgradient of the apparent source, i.e., at FSMW-8A and FSMW-9A, groundwater concentrations attenuated rapidly after operations began.
  - This attenuation has more recently extended to beyond the OU2 boundary, with significantly lower contamination levels measured at FSMW-14A since 2012, and at FSMW-13B, since about 2009. This has the appearance of an aqueous slug of contamination that is flushing out of this portion of the aquifer naturally, once the source was controlled.
- The AS wells were installed at sufficient depth.
- Significant contaminant mass has been removed from the source area.
- Contaminant mass remains in a small area within the installed AS/SVE well network, apparently adsorbed within relatively fined grained soil (silt and clay) at and just above the top of groundwater.<sup>1</sup>

In response to the discovery of residual contamination that was not readily removed by the system as originally constructed and operated, the Frost Street parties have initiated redeployment of selected AS and SVE wells (adding new wells while taking peripheral wells out of service) with the intent of extracting residual mass from this source zone (EnSafe, 2014).

---

<sup>1</sup> This conclusion stems from three observations: concentrations in soil and groundwater throughout the source area were elevated initially; aqueous-phase groundwater contamination rapidly attenuated in surrounding wells with the exception of FSMW-4A, which is immediately adjacent to the source area. In other words, while AS/SVE operations were removing mass and stripping groundwater as it moved away from the source, contaminant mass apparently remains at the source area.

#### **1.2.4 Depth of Frost Street Sites Release Contamination at Source Area**

Groundwater profile borings have been advanced in the vicinity of the source area (by Walden Associates in 2004, pre-AS/SVE operations; in 2006; and more recently in 2009-2010). Groundwater was found to be contaminated in this source zone to a depth of about 100 feet bgs with PCE, nominally at about 2 to 6 mg/L in 2004 borings B-1, B-2, and B-3, and more recently in the center of the AS/SVE treatment zone at about 3 mg/L (80 to 100 feet bgs sampling interval; EnSafe, 2014).

In wells around the source area, specifically FSMW well nests FSMW-2, FSMW-4, FSMW-8, FSMW-9 and FSMW-10, appreciable contamination has been seen only in the wells screens identified as "A" wells, which were set nominally at 60 to 70 feet bgs. None of the related "B" wells screened at about 115 to 150 feet bgs have ever shown significant PCE contamination.<sup>2</sup> In recent samples from these "B" well screens, little or no PCE has been observed — evidence of sufficient depth and effectiveness of the AS/SVE system.

#### **1.2.5 Downgradient Shallow Plume**

As indicated by groundwater quality profile borings and wells, PCE in groundwater had migrated — by the time the AS/SVE system began operating — to the south-southwest. In the 2004 and 2009/2010 profile borings, the highest concentrations of PCE in groundwater were found roughly along a line that runs from the source near FSMW-4A to FSMW-14A, and in close proximity to profile borings B-6, GCW-2, and B-9. Laterally, contamination appears to attenuate a short distance east or west of this line.

The highest concentrations are found within a relatively narrow depth interval. At the source zone, heaviest contamination (in both soil and groundwater) extends from top of groundwater at about 50 to 80 feet bgs. Moving downgradient, the highest groundwater concentrations (>5 mg/L PCE) were found in profile borings at the following depth intervals: about 70 feet bgs (the first interval sampled) to 120 feet bgs at B-5, B-6, and GCW-2, and apparently dropping to 170 feet bgs at B-9 to the south of Old Country Road.

Outside of this narrow zone, contamination levels are much lower, even at the depth of about 150 feet bgs. Since sampling was initiated, historical high detections are compared with recent PCE concentrations for wells screens in that interval along Old Country Road (Table 1).

---

<sup>2</sup> The exceptions are the two wells most proximate to the apparent release point: (a maximum of 50 µg/L PCE at FSMW-2B (114 to 124 feet bgs) in 1998, and in FSMW-4B (137 to 147 feet bgs) 230 µg/L PCE in 2003, and one sample in 1998 at FSMW-8B (132 to 142 feet bgs) at 390 µg/L PCE — none of these intervals show significant contamination in more recent sampling.



<b>Table 1</b>					
<b>PCE Concentration Comparison</b>					
<b>Monitoring Well</b>	<b>FSMW-5B</b>	<b>FSMW-11</b>	<b>FSMW-6B<sup>(1)</sup></b>	<b>FSMW-12</b>	<b>FSMW-7B</b>
Depth Interval (feet bgs)	130-140	139-149	137-147	139-149	136-146
PCE (µg/L maximum/year)	4 J/1998	5/2005	220/1998	1/2005	1 J/1998
PCE (µg/L) 2014	0.45 J	2.5 J	67	~2 J	~1 J

Notes:

- bgs = below ground surface  
J = The result is a detection, but at an estimated quantitation.  
µg/L = micrograms per Liter  
(1) = FSMW-6B is the well nearest the apparent center of the plume as indicated by nearby wells and profile borings along Old Country Road.

FSMW-6B is the well nearest to the apparent plume line at about 100 feet east of GCW-2 transverse to groundwater flow. A layer of clay is present along this plume line that coincides with an interval of the most elevated PCE concentrations in groundwater; immediately below which sample concentrations attenuate significantly. At the GCW-2 boring, down-hole geophysics gamma-radiation peak (gamma log) and sieve analyses indicate a significant contrast from predominantly sand to a fines fraction of more than 60% at 101 to 103 feet bgs. The sieve analysis correlates precisely with the gamma log, and the highest PCE concentration in groundwater — 41 mg/L. At nearly every boring in the area downgradient of the AS/SVE system, some clay was found by the visual observation or gamma log, at various depths in each boring, but typically about 90 to 125 feet bgs.<sup>3</sup>

By about 140 feet bgs, in all the profile borings in the plume except B-9, groundwater PCE concentrations attenuate rapidly from tens of parts per million in the intervals above, to the low part per billion concentration level.<sup>4</sup>

Along Old Country Road, wells FSMW-16, FSMW-17, and FSMW-18 were installed in support of the GCW pilot testing and at depths below the nominal 150-foot depth of previously installed wells. The new wells were sampled only during this 2007 through 2009 period. FSMW-18 A/B is located at the FSMW-6 A/B well nest but with deeper intervals screened, and FSMW-16 and FSMW-17 well nests are located just to the east, within about 50 feet of GCW-1. Table 2 summarizes compounds detected (but not also seen in blanks).

<sup>3</sup> Clay was logged shallower in B-6 at about 80 feet bgs, and is absent until nearly 140 feet bgs at boring UVB B-1.

<sup>4</sup> Boring B-9 is immediately adjacent to the FSMW-14 well cluster, which continues to be sampled to monitor plume behavior over time.



<b>Table 2</b> <b>Summary of Detected Compounds</b>						
<b>Monitoring Well</b>	<b>FSMW-16A</b>	<b>FSMW-16B</b>	<b>FSMW-17A</b>	<b>FSMW-17B</b>	<b>FSMW-18A</b>	<b>FSMW-18B</b>
Depth Interval (feet bgs)	50-60	127-137	174-184	223-233	172- 182	221-231
PCE (µg/L)	0.78 J	2.1J-4.5J	2.9J-3.3J	81-86	13	79
TCE (µg/L)	ND	1.3J-2.5J	1.5J	640-690	24	500
Carbon tetrachloride (µg/L)	ND	ND	0.19J	11	1.3J	28

Notes:

µg/L = micrograms per Liter  
J = The result is a detection, but at an estimated quantitation.  
ND = Non-detect

These results for these wells along Old Country Road confirm an interval of relatively uncontaminated water below about 150 feet bgs. Only in the deepest intervals (greater than 220 feet bgs) was there any appreciable PCE found, and that was in samples that had elevated TCE and a trace of carbon tetrachloride, which appears to be an indicator of the plume originating from sites upgradient of the Frost Sites, as it is only found in profile borings and area wells at depth, including those upgradient of Frost Street and the NCIA. There were also low level detections of 1,2-dichloroethenes (highest concentrations in the two deepest intervals), 1,1-dichloroethenes, and 1,2-dichloroethanes found in these samples.

### 1.2.6 Decreasing Concentrations with Time

Over time within the shallower zone of elevated groundwater concentrations associated with the clay layers, concentrations are in decline. Operation of the AS/SVE system appeared to have contained contamination from migrating from the treatment area within a few months of operation. This pattern of decreasing concentrations is now being observed further downgradient.

To illustrate, samples from FSMW-14A, screened between 119 and 129 feet bgs, have historically and repeatedly (from 2005 to 2010) been found to contain on the order of 60 mg/L or more PCE. This concentration dropped to the level of 10 mg/L in 2014. During this same period, samples from FSMW-14B, screened at 159 to 169 feet bgs, have also been elevated in PCE concentration — at the 10 mg/L PCE level historically, dropping to 3 to 5 mg/L in samples from annual events since 2008.

Nearby to the east, the downgradient plume is also present at the FSMW-13B well, screened at 119 to 129 feet bgs, and sampling data exhibit a similar trend: a characteristic concentration of 3 to 4 mg/L PCE through 2009, and less than 1 mg/L since.

### **1.2.7 Comprehensive Remedy**

The remedial action to be implemented in response to the shallow PCE plume downgradient of the NCIA, as selected by U.S. EPA with the recent OU1 ROD and as refined in a related technical memorandum, is to control the plume via hydraulic containment. Subject to remedial design, this is to be accomplished by pumping at a rate of about 20 gallons per minute from a well about 250 feet downgradient of the FSMW-14 well, which is itself only 250 feet south of Old Country Road. The expected capture zone includes an area that encompasses FSMWs-13 and 14. The extracted water would be pumped to a treatment facility and likely discharged at the nearby Nassau County recharge area.

In addition, in-situ injections, tentatively of chemical oxidants such as permanganate solution, are planned for the portion of the shallow plume in the immediate vicinity of FSMW-14 that remains above 10 mg/L total chlorinated VOCs (PCE, TCE, and related). The precise scope and location of injections to be conducted is also subject to remedial design, specifically pre-design investigations to delineate the area at or above that threshold of 10 mg/L concentration.

Concentrations measured in groundwater samples from the most shallow interval of FSMW-14 have recently begun to attenuate, and now are at this threshold concentration. Currently, data regarding groundwater quality between the source zone and FSMW-14 along this plume line and at the affected depth interval are available only from groundwater profile borings conducted in 2004 and 2009. No well is located or screened at the appropriate location and depth.

An additional well or wells installed north of Old Country Road, and at the depth intervals of interest, would provide for comparable data and sampling over time. This quality of data would provide an additional indicator of whether and to what extent concentrations along the plume continue to decrease.

Careful logging and sampling of the soil column — and especially the clay features at the location of this well — would provide insight as to whether the clays hold residual contaminant mass, in addition to confining hydraulic dispersion of the plume. To the extent residual mass has sorbed into the clay layers at elevated concentrations, this mass could back diffuse, as otherwise clean groundwater flows through the zone, in effect slowing the attenuation of the plume. Aqueous concentrations along the plume have more recently begun to decrease as indicated by samples at FSMW-14A, but it may be cost-effective to target this zone with an AS/SVE system, or focused injections at or upgradient of Old Country Road along the plume, and thereby accelerate aquifer restoration.

## **2.0 INVESTIGATIVE APPROACH**

With this work plan, it is proposed that additional monitoring wells be installed at Old Country Road, first along the apparent plume line, at depth intervals that bridge a gap between those of existing wells. The nearby profile boring results have indicated elevated concentrations between 50 feet bgs and 130 feet bgs. These profiles may not be representative of what would be observed in a well screen, and attenuation in groundwater contaminant concentrations has been observed in this area of the site since these profiles were advanced. Nevertheless, with the exception of the deeper intervals associated with the Upgradient Site's plume, the existing onsite well network lacks wells screened in the zone most likely to remain elevated in concentration.

### **2.1 Sampling and Well Installation Scope**

#### **2.1.1 Initial Well Nests and Soil Sampling**

One soil boring will be installed to approximately 150 feet bgs just north of Old Country Road, downgradient from the GCW-2 boring. Eight nested monitoring wells will be installed at this location, with screened intervals to bridge the gap between existing wells, or about 70 feet bgs to 150 feet bgs, in ten foot intervals. These nested wells will be installed in 4-8 inch diameter boreholes, one of which being the soil boring to 150 feet bgs. The location of the soil boring and monitoring wells can be found on Figure 1. Additional information can be found in Section 2.2.

#### **2.1.2 Lateral Plume Delineation**

On receipt of laboratory results of initial soil and groundwater samples, an assessment of the site conceptual model will be conducted, and tentative additional investigations and/or remedial actions considered. A technical memorandum will be submitted to NYSDEC that will include investigation results and outline supplemental sampling, as needed, to inform the design of the most promising response actions.

For example, if the groundwater profile developed for groundwater from 70 to 150 feet bgs, identifies analytical exceedances, additional samples will be collected. Groundwater samples will be collected from targeted depths identified in the groundwater profile on either side of the proposed monitoring wells. During the planning of this additional effort, it will be determined if permanent monitoring wells will need to be installed, or if samples can be collected using temporary means (hydropunch, or similar).



### Legend

- ◆ Shallow Well (<150 feet bgs)
- ◆ Deep Well (>150 feet bgs)
- ◆ Proposed Nested Well
- Sample Location
- Approximate Dry Well
- Approximate Sewer Line

Sewer lines and dry wells were digitized from a map provided by Walden Environmental Engineering, PLLC.

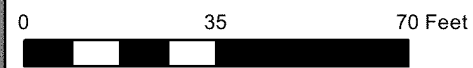


Figure 1  
Proposed Locations  
Supplemental Investigaton  
Frost Street Sites  
Westbury, New York

REQUESTED BY: A. Royko  
DRAWN BY: B. Lipscomb  
DATE: 3/2/2015  
PROJECT NO: 0888811027

**ENSAFÉ**  
1-800-588-7962  
WWW.ENSFAE.COM

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

For example, if residual soil contamination is apparent that would be amenable to AS/SVE or injections additional sampling would be proposed at this point to determine areal extent of the contamination that would be targeted by such actions. Absent residual contamination in soil, the lateral extent of elevated groundwater contaminant concentrations may require definition.

## **2.2 Implementation**

### **2.2.1 Soil Boring and Monitoring Well Installation**

The boring and monitoring wells will be installed using Rotosonic™ technology. This will allow continuous soil sampling and logging to be performed quickly with minimal site interruption, relative to hollow stem auger or mud rotary drilling with continuous split spoon sampling. Drilling operations and subsequent groundwater sampling will be performed in accordance with the NYSDC-Approved Health and Safety Plan (HASP), Community Air Monitoring Plan (CAMP), and Quality Assurance Project Plan (QAPP) included as Appendices A, B, and C, respectively.

The first five feet of each boring/monitoring well will be hand cleared to identify potential utilities. If refusal occurs, the depth of refusal will be noted and the boring will be offset. In the soil boring to 150 feet bgs, soil will be continuously logged, whereas the other boreholes for the other monitoring well installations will not be logged. Soils will be screened every 6-inches with a photoionization detector.

Soil analytical sampling for VOCs will be performed at a frequency to be determined based on subsurface conditions. Soil sampling will be focused on clay layers and soil with high photoionization detector readings or other screening tests. Specifically, if a clay layer is found with indication of residual contamination present, soil sample aliquots will be collected from both the top of the clay and lower in the body of finer grained soil. Soil samples will be analyzed for target compound list VOCs via U.S. EPA Method 8260B.

Two wells will be installed in each of the four boreholes, spaced such that there is forty vertical feet of spacing between wells installed in the same borehole. The monitoring wells will be constructed of two-inch inner diameter, flush-threaded, schedule 40, polyvinyl chloride riser, 0.010-inch slot well screen. The annular space between the well screen and borehole wall will be backfilled with chemically inert, #0 sand, to two feet above the well screen. A two-foot thick, bentonite clay seal will be placed above the sand pack. The remaining annular space will be filled to grade with cement/bentonite grout. Each monitoring well will be fitted with a flush-mounted road box secured. All wells will be developed in accordance with Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells (U.S. EPA, March 1991).

### **2.2.2 Groundwater Gauging and Sampling**

One round of site-wide groundwater elevation gauging and sampling will be performed, in which select monitoring wells along Old Country Road in the vicinity of the new monitoring wells will be sampled. Groundwater samples will be analyzed for target compound list VOCs via U.S. EPA Method 8260.

Water samples will be collected in accordance with U.S. EPA guidance for low flow groundwater sampling. Groundwater quality parameters will be recorded and the sample will be collected once parameters stabilize. If parameters do not stabilize, the wells will be purged a maximum of five well volumes.

### **2.2.3 Analytical Data Validation**

The analytical data packages will be validated by a data validator for evaluation in accordance with U.S. EPA standards. The data validator will evaluate the laboratory's ability to meet the data quality objectives provided in the QAPP. Any non-compliant data will be flagged in accordance with NYSDEC Analytical Services Protocols. The validated data will be presented to the NYSDEC for review.

### **2.2.4 Community Air Monitoring Plan**

EnSafe will conduct perimeter air monitoring and work zone monitoring in accordance with the CAMP. A copy of the CAMP is provided in Appendix B.

If necessary, dust control measures will be implemented to minimize the potential for dust generation during supplemental investigation (SI) activities. Dust control measures will include water spraying and limiting dust generating activities. If necessary, odor control measures will be implemented at the site to minimize the potential exposure to nuisance odors, including containerizing or covering impacted soil.

### **2.2.5 Decontamination**

The objectives of the decontamination plan at the Site are to provide the procedures and equipment necessary to decontaminate personnel and equipment to prevent cross-contamination from work areas to public areas (i.e., highways, roads, support trailer, vehicles, etc.). This plan does not replace the decontamination procedures outlined in the HASP and QAPP, included as Appendices A and C, respectively. This plan provides additional guidelines on decontamination locations, necessary equipment, and procedures.

### **Personnel Decontamination**

A field decontamination/cleanup area will be available onsite. Personal protective equipment will be disposed of in a drum or large plastic garbage bag. Additional details for personnel decontamination are presented in the HASP contained in Appendix A.

### **Equipment Decontamination**

Equipment decontamination will take place on a decontamination pad when feasible. Decontamination activities shall include the removal of contaminated soil, debris, and other miscellaneous materials from all drilling equipment and tools that have come in contact with contamination. Other drilling equipment, hand tools, and small equipment that come in contact with impacted soil or groundwater will be decontaminated on the decontamination pad in buckets of water and detergent.

Wastewater from equipment decontamination will be collected and pumped into either 55-gallon drums or frac tanks. Wastewater will be disposed of onsite via the onsite treatment system, with ultimate discharge to the sewer in accordance with the 2015 Nassau County Department of Public Works approval letter. Soils collected from the decontamination pads will be drummed and sent to the properly-licensed-approved disposal facility, as necessary.

### **Decontamination Supplies**

A sufficient supply of materials/equipment required to implement decontamination procedures will be maintained, including, but not limited to, the following items:

- Large plastic garbage bags
- Wash basins and/or decontamination pad
- Alconox<sup>™</sup> detergent concentrate
- Hand pump sprayers
- Long handled soft bristle brushes
- Large sponges
- Steam generator, if needed
- Liquid detergent and paper towels
- Supplies/equipment to construct the decontamination pads
- All necessary hosing, connections, etc., to collect and transport decontamination fluids to the drums and system.

### **2.2.6 Investigation-Derived Wastes**

Soil cuttings and water produced during well development and decontamination will be collected and contained within 55-gallon, United States Department of Transportation drums, roll-off, or frac tank. EnSafe will arrange for the disposal of the investigation-derived waste. Assuming the current waste characterization profile for the site is still valid, no additional waste characterization samples are required. If the profile is no longer valid, EnSafe will collect the necessary waste characterization sample(s) to facilitate the disposal of investigation-derived waste.

Water produced during well development and/or decontamination will be disposed of via the onsite treatment system, with ultimate discharge to the sewer in accordance with the 2015 Nassau County Department of Public Works approval letter.

### **2.2.7 Traffic Control**

When working within the parking lot, highly visible safety items including traffic cones/barriers, caution tape, and men working signs should be used. The work zone should be appropriately delineated to keep parking lot traffic away from the work zone.

### **2.2.8 Restoration Plan**

Upon completion of the SI activities, the Site surface will be returned to the pre-SI activity conditions. Restoration actions may include, but are not limited to:

- Replacement of asphalt and concrete areas that were disturbed
- Demobilization of any waste generated(s)
- Removal of all equipment and barricades
- Demobilization of the CAMP equipment
- Removal of any decontamination pads



### **3.0 ENGINEERING EVALUATION/SUPPLEMENTAL REMEDY RECOMMENDATIONS**

Based on soil and groundwater sampling results from the new borings and well nests, if residual PCE mass remains in soil at concentrations that point to this area being a residual source of elevated groundwater contamination, it is proposed to follow with delineation of breadth of the clay layer or layers and elevated concentrations found transverse to groundwater flow. This will be accomplished through soil borings, groundwater profile sampling, or the installation of additional wells or well nests to the east and west along Old Country Road.

Such information will define a target area for injections, or other response actions (such as a supplemental AS/SVE wells, possibly entailing an extension of the existing system) that would address this residual mass. The remedial design objective is to support the comprehensive response to the shallow PCE plume in OU1, i.e., a supplemental source remedy.

On the other hand, if initial findings, or subsequent delineation of the plume, points to simple historic migration of aqueous groundwater contamination from the upgradient source area still under treatment by AS/SVE operations, response actions may more logically be focused on capture of the plume that has already migrated downgradient at the U.S. EPA OU1, in which case the upgradient source remedy satisfies the OU1 ROD requirements for source control actions, and it is much more practicable to step downgradient to contain.

At the conclusion of the supplemental investigation work, a focused feasibility study will be conducted and documented, and will include investigation results and recommendations, in the form of a remedial action plan, for appropriate supplemental responses.



#### **4.0 SCHEDULE**

Implementation tasks will generally follow the following schedule; NYSDEC will be notified at least one week prior to deployment for field efforts:

1. NYSDEC review and approval (four weeks)
2. Contractor Selection/Subcontracting (six weeks)
3. Utility clearance and new well drilling (two weeks)
4. Well Sampling and analysis. Results and recommendations will be included in the appropriate monthly progress report (three weeks)
5. Lateral delineation field investigation (scope and schedule to be determined)
6. Focused Feasibility Study/Remedial Action Plan (six weeks after data received)
7. Remedy Implementation (construction season 2016)



## 5.0 REFERENCES

Dvirka and Bartilucci. Pre-Design Investigation Report New Cassell Industrial Area Operable Unit No.3. April 2009.

EnSafe Inc. Revised Source Zone Treatment System Optimization Proposal. 2014, June 19.

HDR and O'Brien and Gere Joint Venture. Supplemental Feasibility Study Technical Memorandum for Operable Unit 1 for the New Cassel/Hicksville Groundwater Contamination Superfund Site, Nassau County, New York. July 2013.

Lawler, Matusky & Skelly Engineers, LLP. Remedial Investigation/Feasibility Study (RI/FS) Report - New Cassel Industrial Area Offsite Groundwater, Town of North Hempstead, Nassau County. September 2000.

Nassau County Department of Public Works. Disposal of Redevelopment, Monitoring Well Purge, and SVE/AS Knockout Tank Water Approval Letter. 2015, February 24.

New York State Department of Environmental Conservation. Technical Guidance for Site Investigation and Remediation. 2010, May 3.

U.S. EPA. Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells, EPA 600/4-89/034. March 1991.

- Record of Decision, Operable Unit 1, New Cassel/Hicksville Groundwater Contamination Superfund Site, Towns of North Hempstead, Hempstead, and Oyster Bay, Nassau County, New York. September 2013.

**Appendix A**  
**Health and Safety Plan**

# **PROJECT HEALTH AND SAFETY PLAN**

**Frost Street  
Westbury, New York**

**EnSafe Project Number  
0888811027**

**Prepared for:**

**Frost Street Parties  
NYSDEC Site No. 1-30043 I, L, M**

**Prepared by**



**EnSafe Inc.  
5724 Summer Trees Drive  
Memphis, Tennessee 38134  
(901) 372-7962**

**September 2014**

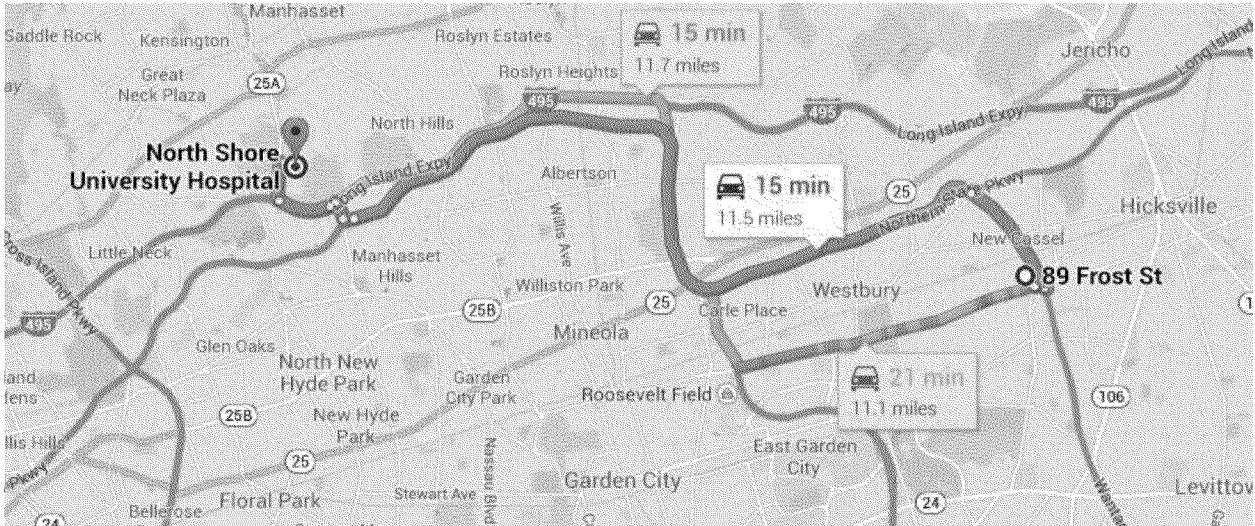
## Emergency Telephone Numbers

Ambulance — Westbury Fire Department	<b>Emergency 911</b>
Westbury Fire Department	<b>Emergency 911</b>
Nassau County Police Department	<b>Emergency 911</b>
Hospital — North Shore University Hospital - Manhasset	(516) 562-0100
Minor Medical Treatment — Premier Care of Carle Place	(866) 255-2381
National Capital Poison Center	(800) 222-1222

## Key Personnel Telephone Numbers

Title	Category	Data
EnSafe Site Supervisor/H&S	Name	Alexandra Royko aroyko@EnSafe.com
	Work	(860) 665-1140 x6022
	Mobile	(401) 212-0149
EnSafe Project Manager	Name	Craig Wise cwise@EnSafe.com
	Work	(901) 937-4243
	Mobile	(901) 340-4789
EnSafe Corporate Health and Safety Manager	Name	John Knopf jknopf@EnSafe.com
	Work	(901) 937-4255
	Work (toll Free)	(800) 588-7962 x321
	Mobile	(901) 451-1464
EnSafe Health and Safety Specialist	Name	Eric Allen eallen@EnSafe.com
	Work	(901) 937-4281
	Mobile	(901) 359-6698

**Primary Hospital Directions and Map**  
**North Shore University Hospital**  
**300 Community Drive, Manhasset, New York, 11030**  
**(516) 562-0100**



**Frost Street Site**  
**89 Frost Street**  
**Westbury, New York 11590**

- Head south on Frost St toward Old Country Rd
- Turn left onto Old Country Rd
- Slight right onto the ramp to N Westbury
- Merge onto Wantagh State Pkwy
- Keep left at the fork, follow signs for Northern State Parkway W/New York and merge onto Northern State Pkwy
- Take exit 26N to merge onto New Hyde Park Rd toward N Hills
- Merge onto New Hyde Park Rd
- Turn left onto N Service Rd
- Slight right to stay on N Service Rd
- Turn right onto Community Dr
- Turn right

**North Shore University Hospital**  
**300 Community Drive**  
**Manhasset, New York 11030**

## Table of Contents

1.0	PURPOSE.....	1
2.0	SITE DESCRIPTION AND HISTORY .....	2
3.0	DOCUMENTATION AND PROCEDURES .....	3
4.0	ROLES AND RESPONSIBILITIES.....	4
4.1	Corporate Health and Safety Manager .....	4
4.2	Site Health and Safety Specialist .....	4
4.3	Site Supervisor .....	4
4.6	Employees.....	4
5.0	SITE HAZARDS .....	6
5.1	Physical Hazards.....	6
5.1.1	Underground Utilities .....	6
5.1.3	Above-ground Utilities .....	6
5.1.2	Procedures for Hot and Cold Weather.....	6
5.1.3	Severe Weather .....	8
5.1.4	Biological Hazards.....	9
5.1.5	Noise Control.....	9
5.1.7	Medical Monitoring Program.....	9
5.2	Chemical Hazards .....	9
5.3	Process Hazards .....	9
5.4	Vehicle Hazards .....	9
5.5	Site Work Zones .....	10
5.5.1	Support Zone .....	10
5.5.2	Contaminant Reduction Zone.....	10
5.5.3	Exclusion Zone .....	10
6.0	PERSONAL PROTECTIVE EQUIPMENT .....	11
6.1	Job Hazard Analysis .....	11
6.2	Control Method Approach .....	11
6.3	Minimum Requirements for PPE .....	12
6.4	Eye Protection .....	12
6.5	Hearing Protection .....	12
6.6	Foot Protection .....	13
6.7	Skin Protection (Clothing).....	13
6.8	Skin Protection (Gloves) .....	13
6.9	Respiratory Protection .....	13
6.10	Head Protection .....	14
6.11	Vehicle Occupant Protection.....	14

7.0	JOB TASKS .....	15
8.0	AIR MONITORING REQUIREMENTS.....	16
9.0	DECONTAMINATION .....	17
10.0	SANITARY FACILITIES AND LIGHTING REQUIREMENTS.....	18
11.0	QUALIFICATIONS AND TRAINING.....	19

## **Tables**

Table 2-1	General Information.....	2
-----------	--------------------------	---

## **Appendices**

Appendix A	Forms
Appendix B	Emergency Action Plan
Appendix C	Site Specific Contact List
Appendix D	Emergency Medical Care Driving Directions
Appendix E	Biological and Chemical Hazards
Appendix F	Job Hazard Analyses



## **1.0 PURPOSE**

This Health and Safety Plan (HSP) was prepared for activities performed at the Frost Street site in Westbury, New York. This HSP specifies procedures and protective measures to mitigate risks and ensure the health and safety of workers and other individuals in and around the site.

The objective of this project is to expand an existing air sparge (AS)/soil vapor extraction (SVE) system. EnSafe employees will oversee drilling, well installation, and trenching and piping activities.

The provisions of this plan are mandatory for all EnSafe personnel and EnSafe subcontractors associated with waste study activities at the Site. All onsite EnSafe personnel shall read this plan and sign the accompanying plan acceptance form, located in Appendix A, before performing any site activities. EnSafe subcontractors will not sign this plan.

The following Code of Federal Regulations also apply and will be followed: Title 29 Code of Federal Regulations Part 1910.120, Standards for Hazardous Waste Operations and Emergency Response (HAZWOPER). These regulations include the following provisions for employees: training, Section 1910.120(e); medical surveillance, Section 1910.120(f); personal protective equipment (PPE), Section 1910.120(g), and requirements of a site safety and health plan 1910.120(b)(4)(ii).

It is the obligation of every employee to work safely, to help ensure the safety of his/her coworkers, and to bring any potential or previously unrecognized hazard to the attention of the EnSafe site supervisor. EnSafe will suspend site work and will instruct all personnel to evacuate the area under the following conditions:

- If inadequate safety precautions are being taken
- If it is believed that site personnel may be exposed to an immediate health hazard

In the event of an emergency, refer to the Emergency Action Plan located in Appendix B. Emergency contacts for police, ems, fire, and corporate are located in Appendix C. Also included are directions to the emergency medical care driving directions, Appendix D.

Compliance with the Health and Safety Plan will be verified by periodic safety audits, as needed, to be conducted by the site health and safety specialist, or his or her designee.

## 2.0 SITE DESCRIPTION AND HISTORY

**Table 2-1**  
**General Information**

Site Name:	Frost Street
Site Location:	89 Frost Street, Westbury, NY 11590
Tasks Included:	Air sparge/soil vapor extraction system expansion
Hours of operations:	Work will be conducted mainly during daylight hours
Potable drinking water:	Bottled water and/or coolers will be provided
Toilet facilities:	Toilet facilities are available near the site at local businesses

The Frost Street Parties properties at 89 Frost Street, 101 Frost Street and 770 Main Street (collectively, "Frost Street Sites") in Westbury, NY, are located west of the intersection of Old Country Road and the Wantagh State Parkway in the New Cassel Industrial Area (NCIA). Work covered in this HSP will be performed at 89 Frost Street.

Pursuant to the terms of the Consent Orders executed by the Frost Street Parties on December 12, 2002, the Frost Street Parties agreed to implement the soil and groundwater remedies specified in the RODs. Specifically, an air sparge (AS)/soil vapor extraction (SVE) system was installed and has been operating at the Frost Street Sites since September 2005. During the course of its continuous operation, the AS/SVE remediation system has effectively reduced groundwater and soil volatile organic compound (VOC) concentrations within most of the treatment zone. However, the system and groundwater monitoring data show that the VOC concentrations in groundwater in a portion of the 89 Frost Street property (in the vicinity of monitoring well FSMW-4A) have remained relatively unchanged after initially decreasing by about 50 percent following SVE/AS system startup. The data indicate that a residual source may remain on the 89 Frost Street property.

Chemicals of concern at the site are volatile organic compounds (VOCs), specifically tetrachloroethene (PCE) and trichloroethene (TCE).

EnSafe will provide oversight for all intrusive work. Drilling depths will extend to approximately 90 feet below ground surface and excavations that will be a maximum of twelve feet deep; the majority of the excavations will be less than four feet. EnSafe field personnel will use a Photoionization Detector (PID) to test each soil sample in order to ensure safety for all EnSafe employees in the sample area. EnSafe will also perform community air monitoring in accordance with New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), Appendix 1A of Technical Guidance for Site Investigation and Remediation (DER-10).

### **3.0 DOCUMENTATION AND PROCEDURES**

All injuries, accidents, near misses, and spills must be reported immediately to the EnSafe Corporate Health and Safety Manager. Injuries related to or on a client project will be reported within the same shift that the injury becomes known.

Forms to document items are included Appendix A:

- Health and Safety Plan Acceptance Form
- Daily Safety Meeting
- Safety Work Permit Form
- Utility Checklist
- Near Miss Report Form
- Daily Air Monitoring Forms

#### **On-Site Reviews/Audits**

Onsite reviews/audits will be conducted on a weekly basis by the site health and safety specialist, or designee.

#### **Post-Work Debriefing Reviews**

Post-work debriefing reviews will be scheduled on an as-needed basis. JHAs and other field procedures will be evaluated periodically to determine appropriateness to site tasks. Procedures will be reviewed with EnSafe personnel and subcontractors, as needed, to assess lessons learned.

#### **Incident / Accident Procedures**

In the event of a serious near miss or an accident on the jobsite an Incident Investigation Report will be conducted to determine the root cause of each incident and determine the appropriate corrective action(s) to prevent the event from occurring again. In the event of an incident / accident the site will immediately notify the EnSafe Corporate Health and Safety Manager. The PM and Corporate HS Manager will then initiate the investigation process using the site employees and site subcontractors as an investigative team. The results of the investigation will be shared with all applicable parties including the client. Work shall be halted until any immediate unsafe acts and or conditions are mitigated. A blank copy of the incident / accident investigation form can be found in Appendix A (forms).

#### **4.0 ROLES AND RESPONSIBILITIES**

Everyone plays a role in the safety process while on an EnSafe site. Listed below are the responsibilities of each group of people.

##### **4.1 Corporate Health and Safety Manager**

- Ensure all management and affected employees are aware of the EnSafe Corporate Safety Management System and enforce the same.

##### **4.2 Site Health and Safety Specialist**

- Coordinate and manage the overall HSP program.
- Advise Corporate Health and Safety Manager of any program deficiencies noted requiring their action or involvement.
- Periodically review jobs or work areas for engineering, administrative, or other controls that would preclude the need for PPE.
- Authorize Job Hazard Analysis (JHA) reviews when determined necessary.
- Make routine surveys of work areas to ensure utilization of PPE by employees in applicable areas or job tasks.
- Oversee and provide guidance for JHAs, and inform applicable staff when PPE requirements are modified.
- Maintain all training records for HSP training.

##### **4.3 Site Supervisor**

- Oversee and direct all onsite task activities to address client project demands.
- Hold all site personnel accountable to the requirements as set forth in this HSP.

##### **4.6 Employees**

- Obey all established requirements outlined in the HSP.
- Use PPE supplied by the company in all applicable areas and while performing designated tasks.
- Use all existing engineering controls, work practice controls, and/or administrative controls provided.
- Inform supervisor if PPE may not be providing the appropriate level of protection.
- Affected employees must participate in training sessions as scheduled.
- Require the use of PPE for subcontractor personnel in all PPE-required areas. Make sure subcontractors are aware that disregarding PPE regulations will result in disciplinary action



which may include removal from the job.

- Follow all directions given by the Site Supervisor and Site Health and Safety Specialist, or designee.

## **5.0 SITE HAZARDS**

The sections below will outline the associated site hazards to be aware of while on-site and conducting work.

Following is a list and brief description of the onsite hazards that could reasonably be expected to be encountered during onsite activities. Following the description of onsite hazards are the general protective measures which will be employed to reduce the risk posed by each.

### **5.1 Physical Hazards**

Field personnel should be aware of and act to minimize dangers associated with physical hazards typically encountered during intrusive activities. These hazards include under and above-ground utilities; hot, cold, and severe weather; biological hazards; noise; and process hazards, such as heavy equipment, which are explained in more detail in Appendix F.

#### **5.1.1 Underground Utilities**

A utility clearance will be performed at the site. New York One Call shall be contact to locate all possible underground utilities at this site.

#### **5.1.3 Above-ground Utilities**

A visual inspection of the site should be conducted to locate any above ground utilities. A minimum 10 feet clearance should be maintained from any line of 50 kilovolt (kv) or less. As a best practice EnSafe does not allow drilling underneath power lines unless cleared with the Corporate Health and Safety Manager.

#### **5.1.2 Procedures for Hot and Cold Weather**

The SSO will evaluate the expected temperature for the day before arriving at the site. If the initial ambient air temperature is indicated to be below 40°F or above 90°F, site workers will be monitored for heat and cold exposure. All temperature measurements will be recorded in the Site Safety Log, a sample page from which is included in Appendix A.

#### **Cold Exposure**

Site workers will be actively monitored for the following symptoms of hypothermia if protracted (i.e., >1 hour in duration) onsite operations are conducted when the air temperature is below 40°F:

- Speech problems (e.g., slurring),

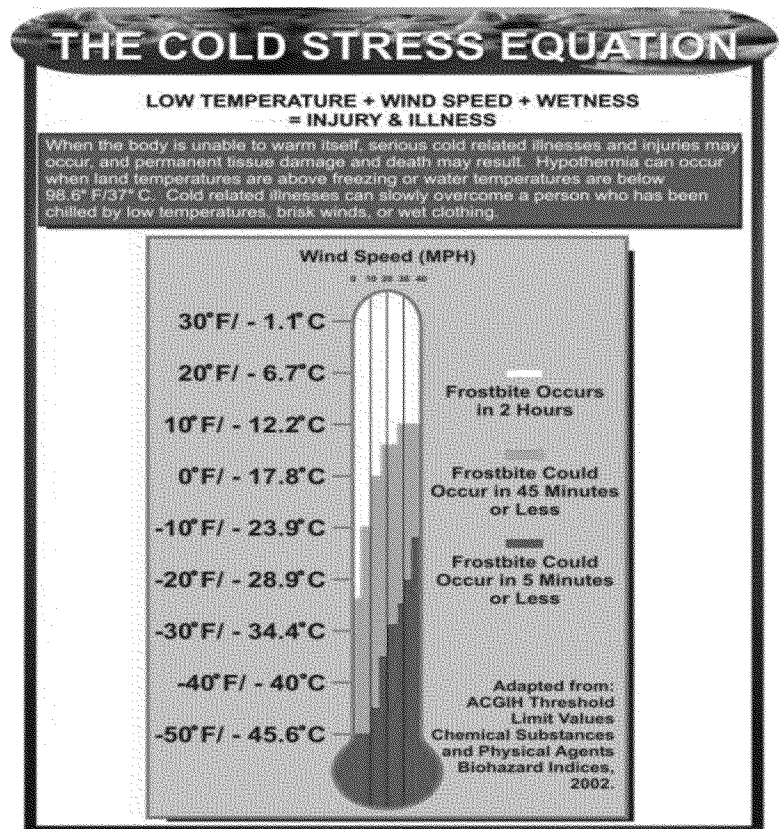
- Skin with "goose bumps" and a bluish or "dead white" appearance,
- Vertigo, and/or
- Intense shivering.

If a worker develops one or more of these symptoms, he/she will immediately be taken to a warm, sheltered area and his/her oral temperature taken. Any worker thus affected will remain in the sheltered area until his/her temperature is measured at 98.6°F and/or the above-mentioned symptoms desist. Any worker exhibiting an oral temperature below 95°F or who loses consciousness will immediately be transported to North Shore University Hospital, 300 Community Drive, Manhasset, New York, 11030.

If protracted onsite activities are undertaken in air temperatures lower than 40°F, site workers will be monitored for the following signs of frostbite:

- Extreme pain and cold in exposed area(s) of skin;
- Loss of dexterity;
- Numbness; and/or
- Pale or blotchy skin.

Any site worker exhibiting one or more of these symptoms will be withdrawn from the site to a warm, sheltered area and his/her affected extremities will be warmed (without rubbing). If symptoms persist or if true frostbite is suspected, the subject will be transported to the hospital immediately.



## Heat Exposure

If protracted site operations are conducted when air temperatures are above 90°F, site workers will be monitored for the following signs and symptoms of heat-related illnesses:

- Hot, dry skin (usually red or mottled) or clammy, moist skin (with pale complexion)

- Confusion
- Loss of consciousness, fainting
- Nausea
- Fatigue
- Giddiness

H E A T I N D E X										
Air Temp. ↓ Relative Humidity ↓	70°	75°	80°	85°	90°	95°	100°	105°	110°	
	Apparent Temperature (Degrees Fahrenheit)									
0%	64°	69°	73°	78°	83°	87°	91°	95°	99°	
10%	65°	70°	75°	80°	85°	90°	95°	100°	105°	
20%	66°	72°	77°	82°	87°	93°	99°	105°	112°	
30%	67°	73°	78°	84°	90°	96°	104°	113°	123°	
40%	68°	74°	79°	86°	93°	101°	110°	122°	137°	
50%	69°	75°	81°	88°	96°	107°	120°	135°	150°	
60%	70°	76°	82°	90°	100°	114°	132°	149°		
70%	70°	77°	85°	93°	106°	124°	144°			
80%	71°	78°	86°	97°	113°	136°	157°			
90%	71°	79°	88°	102°	122°	150°	170°			
100%	72°	80°	91°	108°	133°	166°				

## HOW TO USE HEAT INDEX:

Across top (Air temperature) locate today's predicted high temperature.

Down left side (Relative Humidity) locate today's predicted humidity.

Follow across and down to find "APPARENT TEMPERATURE" or "WHAT IT FEELS LIKE".

Heat Index Values were devised for shady, light wind conditions. Exposure to full sun can increase values by up to 15°. Strong winds, particularly with hot, dry air can be extremely hazardous.

Any site worker exhibiting one or more of these symptoms will be withdrawn from the site to a cool, sheltered area for further evaluation. If symptoms persist, the subject will be transported to the hospital. Also, any site worker who loses consciousness will immediately be transported to the hospital.

### 5.1.3 Severe Weather

Fieldwork shall not be conducted when lightning can be seen or thunder heard from the work area. When lightning and/or thunder occur, employees are to cease work, perform emergency personal and equipment decontamination as needed, then seek shelter. Work shall not resume until lightning and/or thunder have not been detected for a period of not less than 15 minutes.

During extreme weather conditions, the SSO shall use his best judgment and has the authority to stop fieldwork or dismiss workers for the day. Examples of conditions that may warrant work stoppage include: tornado warnings, high winds, hail, and flooding.

#### **5.1.4 Biological Hazards**

Biological hazards that may be present at the site include snakes, poisonous vegetation, rodents, spiders, and ticks. Additional information regarding hazards that may be encountered is included in Attachment F.

#### **5.1.5 Noise Control**

Personnel shall wear appropriate hearing protection devices in areas where sound levels could exceed federal OSHA permissible exposure limit for noise of 85 decibels measured on the A-weighted scale (dBA) for an 8-hour time-weighted average (TWA), including when drill rigs or other heavy machinery is operating. A rule of thumb is to wear hearing protection if personnel must raise their voices to be heard at arm's length.

#### **5.1.7 Medical Monitoring Program**

Medical monitoring is a necessary part of the health and safety program at EnSafe. All employees are required to participate in the program and undergo yearly checkups or as needed. The EnSafe Medical Monitoring Program is outlined in the EnSafe Corporate Health and Safety Plan.

### **5.2 Chemical Hazards**

Health and safety protocols and Personal Protective Equipment (PPE) have been selected to protect against hazards presented by materials that may be encountered during AS/SVE system expansion activities. The chemicals of concern are volatile organic compounds (VOCs), specifically tetrachloroethene (PCE) and trichloroethene (TCE).

### **5.3 Process Hazards**

The process hazards, such as heavy machinery, equipment, and excavation safety, are described in detail in the Job Hazard Analyses (JHA's) located in Attachment F.

### **5.4 Vehicle Hazards**

Site activities will be performed in an active parking lot. EnSafe personnel and EnSafe subcontractors shall maintain a physical boundary of the work area to maintain safety of the workers and public in the work area. Effort will be taken to maintain the flow of traffic without impacting the safety of the onsite employees, but if necessary, a portion of the traveled right-of-way in the parking lot will be closed.

## **5.5 Site Work Zones**

The work zone will be divided into three areas: a support zone, a contaminant reduction zone, and an exclusion zone based on the degree of danger present. To the extent possible, the support and contaminant reduction zones will be established outside of the exclusion zone.

### **5.5.1 Support Zone**

The support zone will be located outside of the exclusion zone. Personnel allowed in this area include all site personnel, visitors, and representatives of regulatory agencies and observers. No particular training or personal protective devices are needed in the support zone.

### **5.5.2 Contaminant Reduction Zone**

The contaminant reduction zone will be located between the support zone and the designated exclusion zone. In this area, authorized personnel will don PPE that is needed in the exclusion zone. When exiting the exclusion zone, personnel will remove contaminated PPE in this zone.

### **5.5.3 Exclusion Zone**

The exclusion zone is the immediate work area and adjacent area as defined by EnSafe personnel and subcontractors.

## **6.0 PERSONAL PROTECTIVE EQUIPMENT**

The purpose of this section is to establish and maintain PPE that protects employees from hazards present on the jobsite.

### **6.1 Job Hazard Analysis**

Where one does not already exist, a JHA will be conducted to determine the appropriate PPE for any task. JHA reports will be maintained by the Site Health and Safety Specialist, or designee. JHAs will be reviewed for accuracy according to the following schedule.

- Whenever a change in production, process, equipment, or controls may result in additional or different hazards.
- When an incident is reported that indicates the proper level of PPE may not be assigned for a particular task or job.
- Every three years (i.e., three years from the last review date).

Task specific Job Hazard Analyses (JHAs) are included in Appendix F.

The PPE for each task/position will be selected by the Site Health and Safety Specialist, or designee using the JHA and other resources.

### **6.2 Control Method Approach**

EnSafe will use common hazard reduction approaches to control or reduce workplace hazards. They are, in order of preference:

- Engineering controls
- Substitution or elimination
- Process changes
- Isolation of the hazard
- Guarding, tools, and barriers
- Work practice controls
- Administrative controls
- Personal protective equipment (PPE)

When economically and technically feasible, EnSafe will initially attempt to reduce jobsite hazards through engineering and work practice controls. When these efforts have been exhausted or

considered not to be feasible, administrative controls and PPE will be utilized.

### **6.3 Minimum Requirements for PPE**

General PPE for this site includes:

- Hard hat
- Safety glasses
- Steel or composite-toed safety boots
- Leather gloves
- Nitrile gloves

Whenever a general type of PPE is required, either as a companywide requirement or for a specific task, it will meet or exceed the following requirements. All PPE to be used must meet or exceed all applicable American National Standards Institute (ANSI) standards.

### **6.4 Eye Protection**

- The side of the eye will be protected by using clear side shields or a "wraparound" glass style that provides similar coverage with a minimum of optical distortion.
- Side shields will be rigid with firm mounts to the temple bars. Slip-on disposable side shields do not offer sufficient protection and are prohibited.
- Contact lenses may be worn under safety glasses, except during hot work (welding/cutting), when materials that are irritating to the eyes are being handled, or when the employee is working with solvents.
- Any task or risk area involving exposure to liquid thermal; liquid or solid corrosive; skin toxic; high-pressure, high-velocity liquid, or solid streams; or radiation hazards will have either safety glasses supplemented by a face shield, chemical splash goggles and face shield, chemical splash goggles, or tinted lenses, depending on a risk assessment of the operation. The use of a face shield by itself does not provide adequate eye protection from chemical splashes.
- Impact resistance and other certification requirements such as combustibility will be referenced against the ANSI Z87.1, which will be the minimum requirement.

### **6.5 Hearing Protection**

- Hearing protectors will be selected and worn to attenuate noise to below 85 decibels adjusted.
- Hearing protection is necessary during most activities.

- All hearing protection devices will be used in accordance with the EnSafe Hearing Conservation Program.

## **6.6 Foot Protection**

- All foot protection must be equipped with hard toes, nonskid soles, and a defined heel.
- Safety footwear will have closed toes and sides.
- The footwear's upper part will be made of leather or another nonwoven or non-knit (e.g., felt) equivalent.
- Safety footwear requiring other features such as elongated boot uppers (i.e., boots vs. shoes), protective shank, or metatarsal guards will be required if determined necessary by the JHA.
- Sandals, moccasins, woven cloth tennis shoes, open-toe shoes, and high-heel shoes are not permitted in areas requiring safety shoe usage, unless specifically authorized by the Corporate Health and Safety Manager.

## **6.7 Skin Protection (Clothing)**

- Clothing will be worn to protect the body from direct and indirect contact with hazardous chemical, physical, thermal, and mechanical energies as identified in the individual JHA.
- Short-sleeved shirts and long pants are the minimum required clothing.

## **6.8 Skin Protection (Gloves)**

- Glove types suitable to the hazard will be selected and worn as identified in the individual JHA or as selected by the Site Health and Safety Specialist, or designee.
- The two basic glove types are: impervious gloves for working with solvents, acids, and caustics, and cloth gloves for handling rough or sharp materials.

## **6.9 Respiratory Protection**

Respiratory protection is not anticipated on this project. If a need for such protection is suspected the following will apply:

- Respiratory protection devices suitable to the hazard will be selected and worn as identified in the individual JHA or as selected by the Corporate Health and Safety Manager.
- All respirators will be used in accordance with the EnSafe Respiratory Protection Program.



#### **6.10 Head Protection**

Head protection (e.g., hard hats, bump caps) suitable to the hazard will be selected and worn as identified in the individual JHA or as selected by the Site Health and Safety Specialist, or designee.

#### **6.11 Vehicle Occupant Protection**

Seat belts will be worn by EnSafe employees and passengers traveling in over-the-road vehicles such as cars, vans, or trucks when traveling at the site.

## **7.0 JOB TASKS**

The following tasks will require the use of a job hazard analysis:

- hollow stem auger drilling and well installation
- PW shop floor – high noise areas: Hearing protection

Job Hazard Analysis is included in Appendix F for these tasks.

EnSafe will provide oversight for all intrusive work. Drilling depths will extend to approximately 90 feet below ground surface and excavations that will be a maximum of twelve feet deep; the majority of the excavations will be less than four feet.



## **8.0 AIR MONITORING REQUIREMENTS**

EnSafe field personnel will use a Photoionization Detector (PID) to test each soil sample in order to ensure safety for all EnSafe employees in the sample area. EnSafe will also perform community air monitoring in accordance with New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP), Appendix 1A of Technical Guidance for Site Investigation and Remediation (DER-10).



## **9.0 DECONTAMINATION**

The EnSafe employee will properly dispose of sampling gloves and will wash hands prior to leaving the site. Any PPE that cannot be decontaminated will be bagged and contained in a drum designated for PPE disposal. All decontamination water and materials will be drummed and disposed of off-site. Additional decontamination shall be handled according to the EnSafe Corporate Health and Safety Plan.

The drilling subcontractor will decontaminate any downhole equipment (augers, rods, spoons, etc.) prior to the start of drilling and after each boring by pressure washing with a Liquinox wash and rinse.



## **10.0 SANITARY FACILITIES AND LIGHTING REQUIREMENTS**

Sanitary facilities, permanent or temporary, will be provided on the job site. EnSafe will utilize agreed upon sanitation facilities of businesses within the parking lot where work will be conducted. The requirements for sanitary facilities onsite will meet all applicable standards found in 29 CFR 1910.120(n)(3).



## 11.0 QUALIFICATIONS AND TRAINING

The following table outlines the requirements for EnSafe employees to work at the site.

<b>Title</b>	<b>40-Hour OSHA 8-Hour Refresher</b>	<b>Medically Monitored</b>	<b>Site- Specific Training</b>	<b>FA/CPR</b>	<b>Fire Extinguisher</b>
EnSafe Personnel	Yes	Yes	Review of this HSP	Yes	Yes

Copies of training records for employees are included on-site.

## **Appendix A Forms**

## HAZARD SPECIFIC CHECKLIST

### UNDERGROUND UTILITIES (PUBLIC AND PRIVATE PROPERTY)

Checklist	YES	NO	NA
Has the "State-Specific One Call" been notified to determine the locations of all anticipated public underground utilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have safe work method statements been developed for working near underground utilities and are all field personnel trained in following these work methods?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have all facility diagrams, drawings and other relevant information about the underground utilities been obtained? Have these been reviewed with EnSafe field (including EnSafe subcontractors) and Client facility personnel prior to beginning excavation activities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has an onsite survey been accomplished to identify surface indicators of utilities <i>Example: light posts, valve pits, pit covers, curb/gutter inlets, manholes, etc.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have suitable cable and pipe locating devices been used to confirm position of the utilities? <i>This is highly dependent upon the structure of the underground utility (metal, plastic, clay terra cotta, etc.) and complications due to rebar within concrete, multiple utilities crossing, etc. Only previously-trained personnel should use these devices.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have manual tools been used to dig trial holes to visually identify position/depth of the underground utilities? <i>Example – hand augers, probe rod, etc.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the position of underground utilities been marked on the surface? <i>Appropriate color markings will need to be used. WHITE (Excavation/Borings), RED (Power/Electrical), YELLOW (Gas/Petroleum), ORANGE (Communication/Fiber Optics), BLUE (Potable Water), GREEN (Sanitary/Storm Sewer)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has the location of utilities been plotted on the work area drawing (s)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Has all information concerning the location/depth of all underground utilities been given to the responsible supervisor or contractor at the work site for review and possible offset/relocation? <i>This does NOT only apply to the Project Manager located in the office.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have the relevant authorities been notified of any inconsistencies between the information they provided and the actual location of the utilities? <i>This can be the State One-Call, but also the city and/or county planning/engineering departments. Another onsite visit by the utility-marking personnel may be warranted.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If utilities cannot be located according to plans/drawings provided by the relevant authority, has their assistance been sought to locate the onsite underground utility (s) in question? <i>The authority will probably say no if the utility is located on private property, but an attempt needs to be made.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power tools and mechanical excavators are used with care and at a safe distance from the utilities? <i>This is site-specific, but usually no closer than 3-feet from any and all underground utilities (especially lines with high pressure/flammable/combustible substances).</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Have all workers been kept clear of the excavator bucket while excavation work is conducted in the vicinity of known underground utilities?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
During excavation (at all times), has a watch been kept for evidence of cables, pipes, or other underground utilities not previously identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If heavy equipment is required to cross an area where underground utilities are known to be, have the cross points been kept to a minimum and are clearly marked? <i>A depth of the underground utility to be mobilized over will be needed to not damage the buried utility.</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## Safe Work Assessment & Permit (SWAP)

**IMPORTANT: Please return to PM or their designee for inclusion to the project file.**

### Section 1: Project Information

Project/ClientName: \_\_\_\_\_

SWAP Date/Time: \_\_\_\_\_

Location of the Work: \_\_\_\_\_

Project Number: \_\_\_\_\_

Description of Work: \_\_\_\_\_

Has a HASP been created for this job? ☐ Yes ☐ No

If Yes, has the HASP been reviewed prior to work? ☐ Yes ☐ No

### Section 2: Identify hazards associated with tasks and tools FOR THIS DAY:

**Critical Safety Tasks are listed below:** (If answered "Yes" please call Corporate H&S for additional guidance/checks)

	<u>Yes</u>	<u>No</u>		<u>Yes</u>	<u>No</u>
Performing work in Confined Spaces or Excavations - -	<input type="checkbox"/>	<input type="checkbox"/>	Use of Respiratory Protection- - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Hazardous Chemical Exposure- - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Involvement with Lockout/Tagout Activities - - -	<input type="checkbox"/>	<input type="checkbox"/>
Falls Greater than Six (6) Feet- - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Trenching or Excavation - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Hot Work (Open Flames, Sparking Tools, etc.) - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Drilling or subsurface sampling - - - - -	<input type="checkbox"/>	<input type="checkbox"/>

**List each task that presents hazards and identify controls you will take to minimize risk.**

**Following is a non-inclusive list of potential hazards.**

- Chemicals (inhalation, dermal)
- Biologic Hazards (poison ivy, ants, snakes)
- Potentially unsafe area or neighborhood
- Sampling around heavy equipment (backhoe bucket, Vac. Truck, etc.)
- Working around high noise (> 85 dBA)
- Activities that require coring or drilling
- Drilling around underground utilities
- Work with equipment around power lines
- Slick, uneven walking/working surfaces
- Climbing ladders / scaffolds
- Using gas or propane powered equipment in enclosed areas
- Work in extreme heat (> 104°) or extreme cold (<30°)
- Working around heavy equipment / traffic
- Power tools (hammer drills, auger, etc.)
- Working with lifting / hoisting equipment
- Vehicular traffic, fork lifts, scissors lifts
- Inclement weather (lightning, high winds)
- Work with ergonomic hazards (lifting hazards, twisting, excessive repetitive)
- Working in proximity to deep water > 3ft
- Remote location w/ limited communication

**Task:** \_\_\_\_\_

**Hazards:** \_\_\_\_\_

**Controls:** \_\_\_\_\_

**Task:** \_\_\_\_\_

**Hazards:** \_\_\_\_\_

**Controls:** \_\_\_\_\_

**Task:** \_\_\_\_\_

**Hazards:** \_\_\_\_\_

**Controls:** \_\_\_\_\_

**Task:** \_\_\_\_\_

**Hazards:** \_\_\_\_\_

**Controls:** \_\_\_\_\_

**Task:** \_\_\_\_\_

**Hazards:** \_\_\_\_\_

**Controls:** \_\_\_\_\_

<b>Section 3: Chemical Hazards and PPE:</b>					
<b>Chemical Hazards</b>					
	<u>Yes</u>	<u>No</u>		<u>Yes</u>	<u>No</u>
Radiation or Other Contamination - - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Environmental Toxin - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Flammable/Combustible Materials or Vapors (< 140° FP)	<input type="checkbox"/>	<input type="checkbox"/>	Reactive, Volatile or Explosive - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
RCRA Hazardous Materials (listed or characteristic) - - -	<input type="checkbox"/>	<input type="checkbox"/>	Irritant or Sensitizer - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Corrosive - - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Oxidizer - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Poison, Target Organ Toxin - - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Teratogen or Mutagen - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Biological (mold, poison oak-ivy-sumac, etc.) - - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Carcinogen - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
<b>Routes of Exposure:</b>					
	<u>Yes</u>	<u>No</u>		<u>Yes</u>	<u>No</u>
Inhalation- - - - -	<input type="checkbox"/>	<input type="checkbox"/>	Ingestion (poor hygiene and work practice) - - - -	<input type="checkbox"/>	<input type="checkbox"/>
Skin (dermal absorp.) or Mucus Membranes (eyes, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	Injection (rare) - - - - -	<input type="checkbox"/>	<input type="checkbox"/>
<b>Personal Protective Equipment (PPE) FOR THIS DAY</b>					
Level of Protection:	<input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> D				
Respiratory Protection:	<input type="checkbox"/> None <input type="checkbox"/> Full Face <input type="checkbox"/> Half Face		Cartridge Type: _____		
Protective Clothing:	<input type="checkbox"/> Work Uniform <input type="checkbox"/> Protective Suit		<input type="checkbox"/> High-Visibility Vest/Shirt		
Gloves:	<input type="checkbox"/> Latex <input type="checkbox"/> Nitrile <input type="checkbox"/> Butyl <input type="checkbox"/> PVC <input type="checkbox"/> Neoprene <input type="checkbox"/> Leather <input type="checkbox"/> Other: _____				
Footwear:	<input type="checkbox"/> Steel-Toe Leather <input type="checkbox"/> Steel-Toe Rubber <input type="checkbox"/> Other: _____				
Eye/Face Protection:	<input type="checkbox"/> Safety Glasses <input type="checkbox"/> Face Shield		<input type="checkbox"/> Chemical Goggles		
Head Protection:	<input type="checkbox"/> Hard Hat <input type="checkbox"/> Bump Cap		<input type="checkbox"/> Other: _____		
Hearing Protection:	<input type="checkbox"/> Ear Plugs <input type="checkbox"/> Muffs		<input type="checkbox"/> Combination (List) _____		

<b>Section 4: Emergency Contact Information</b>	
<b>Name:</b>	<b>Name:</b>
<b>Number(s):</b>	<b>Number(s):</b>
<b>Name:</b> EnSafe HR – Heather Collins	<b>Name:</b> EnSafe Corporate Health and Safety – John Knopf
<b>Number(s):</b> 901-937-4366 (Office)	<b>Number(s):</b> 901-937-4255 (Office) or 901-451-1464 (Cell)

<b>Section 5: SWAP Review and Certification (All crew members and affected subcontractors)</b>			
Printed Name	Company	Signature	Date

**THE LOCATION WHERE THE WORK IS TO BE DONE HAS BEEN EXAMINED AND NECESSARY PRECAUTIONS TAKEN FOR THE WORK.**

I certify that the above listed project has been evaluated for hazards, personal protective measures assigned and communicated with all EnSafe personnel on the jobsite. Changes in scope of work or work conditions may require the modification of existing SWAP or creation of a new SWAP.

SWAP Completed By: Print	SWAP Completed By: Sign	PM Review (Initials)
--------------------------	-------------------------	----------------------

# Project Health and Safety Plan

**INSTRUCTIONS:** This form is to be completed by each person working on the project work site.

Project:

I represent that I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

Signed: \_\_\_\_\_

Print Name: \_\_\_\_\_

Company: \_\_\_\_\_

Date: \_\_\_\_\_

## EnSafe Investigation Report

Select the report type: \_\_\_\_ near miss - \_\_\_\_ incident - \_\_\_\_ injury

1. Dates					
Of Near Miss/Incident/Injury		Investigation Started		Investigation Completed	
2. Location			3. Time		
4. EnSafe Employees					
Injured		Involved		Witnesses	
5. Others					
Injured		Involved		Witnesses	
6. Injured					
Name	Length of time with firm	EnSafe Employee Yes/no	Job Title or Occupation	How long assigned to job	Nature and Extent of Injury
7. Equipment/Tools/Vehicles Involved					
Item:					
Damage:					
Ownership:					

8. Description	
Events leading up to:	
Accident/Incident/Event/Illness:	
Contributing Factors:	
9. Cause	
Immediate Cause:	
Root Cause:	
10. Policy, Work Rule, Regulation, Standard	
Applicable:	
Violations:	

11. Recommendations		
To Prevent Recurrence:		
Additional Training:		
12. Investigation Team		
Leader:		Members:
Signature:		
Date:		
13. Review		
Reviewed by	Signature	Date
Comments:		
14. Corrective Action		
Action	Date	Signature
1		
2.		
3.		
4.		
5.		
6.		



DAILY SITE SAFETY MEETING  
ACKNOWLEDGMENT FORM

Date: \_\_\_\_\_ Project Name: \_\_\_\_\_

Project Address: \_\_\_\_\_

Meeting Conducted By: \_\_\_\_\_

**Section 1: Today's Operations**

---

---

---

---

**Section 2: Health and Safety Topics**

---

---

---

---

**Section 3: Special Considerations**

---

---

---

---

**Section 4: Acknowledgments**

I acknowledge that I attended this safety meeting. I have been informed of today's operations and specific health and safety concerns. I agree to work to the Health and Safety Plan guidelines and understand that failure to do so could result in removal from the site and/or termination.

Printed Name	Signature	Organization



**Appendix B**  
**Emergency Action Plan**

## Emergency Telephone Numbers

Ambulance — Westbury Fire Department	<b>Emergency 911</b>
Westbury Fire Department	<b>Emergency 911</b>
Nassau County Police Department	<b>Emergency 911</b>
Hospital — North Shore University Hospital - Manhasset	(516) 562-0100
Minor Medical Treatment — Premier Care of Carle Place	(866) 255-2381
National Capital Poison Center	(800) 222-1222

## Key Personnel Telephone Numbers

Title	Category	Data
EnSafe Site Supervisor/H&S	Name	Alexandra Royko aroyko@EnSafe.com
	Work	(860) 665-1140 x6022
	Mobile	(401) 212-0149
EnSafe Project Manager	Name	Craig Wise cwise@EnSafe.com
	Work	(901) 937-4243
	Mobile	(901) 340-4789
EnSafe Corporate Health and Safety Manager	Name	John Knopf jknopf@EnSafe.com
	Work	(901) 937-4255
	Work (toll Free)	(800) 588-7962 x321
	Mobile	(901) 451-1464
EnSafe Health and Safety Specialist	Name	Eric Allen eallen@EnSafe.com
	Work	(901) 937-4281
	Mobile	(901) 359-6698

In the event that an unpredictable event occurs such as physical injury to onsite personnel, chemical exposure, or fire, EnSafe will coordinate first with the local plant support personnel. Immediately thereafter, the EnSafe Corporate H&S Manager will be informed. Contacts are provided in Appendix C.

## **During an Emergency**

Emergency procedures are to be followed if any of the following situations develop onsite:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while onsite.
- A condition is discovered that suggests a situation more hazardous than anticipated.

The following emergency procedures should be followed:

- Site work area entrance and exit routes will be planned and emergency escape routes delineated by the site health and safety officer.
- If any member of the field team experiences any effects or symptoms of exposure while on the scene, the entire field crew will immediately halt work and act according to the instructions provided by the site health and safety officer.
- For applicable site activities, wind indicators visible to all onsite personnel will be provided by the site health and safety officer to indicate possible routes for upwind escape.
- Identifying any conditions that suggest a situation more hazardous than anticipated will result in the suspension of work until the site health and safety officer has evaluated the situation and provided the appropriate instructions to the field team.
- If an accident occurs, the Site Manager is to complete an accident report form for submittal to the appropriate company official.
- If a member of the field crew suffers a personal injury, the site health and safety officer will call the ambulance (serious injury) to alert appropriate emergency response agencies or administer onsite first aid (minor injury) as the situation dictates. An Accident Report Form will be completed for any such incident.
- If a member of the field crew suffers a chemical exposure, the affected areas should be flushed immediately with generous amounts of clean water. If the situation dictates, the

site health and safety officer should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt treatment. An Accident Report Form will be completed for any such incident.

### **Unexpected Hazards**

If there is any doubt regarding the degree of hazard of a particular circumstance, and personnel are unsure as to what measures to take or what protective equipment to utilize, the following steps should be taken to ensure the health and safety of those involved.

- 1) Stop Work Immediately and Secure the Area  
Personnel should remove themselves from the hazard or suspected hazard area.
- 2) Contact Supervisor and/or Safety Officer  
Personnel should immediately inform their supervisor regarding the situation.

Personnel will be given proper direction on how to proceed. Many accidents can be avoided by simply removing personnel from the hazard and maintaining good communication.

### **Employee Injury**

In the event that an employee is injured in the field due to physical or chemical hazards, the following course of action should be taken:

- 1) Initiate first-aid procedures using universal precaution techniques and arrange for prompt medical attention for the employee. If possible, remove or evacuate all personnel from the area of immediate hazard.
- 2) If the injury is severe, call emergency services (contact telephone numbers Table B-1).
- 3) Promptly notify Client Emergency Response (see Table C-1).

In the event of a nonemergency accident, the injured worker will first be given immediate and appropriate first aid. If the injury is requiring care that exceeds first-aid applied at the site, then a non-injured worker will drive the injured worker to the hospital to complete the necessary emergency care. The EnSafe Corporate Health and Safety Manager will be notified within 8-hours of the injury and the appropriate injury reporting forms will be completed and submitted to ENSAFE and Client.

**Fire and/or Explosion (no injury)**

If a fire or explosion occurs onsite, the following steps should be taken:

- 1) If the fire is small and manageable, appropriate fire extinguishers should be utilized by properly trained personnel to control the situation. All fire extinguishers must be inspected and certified annually so that they are in proper working condition for possible emergency situations. Projects must maintain a fire extinguisher at the site throughout site activities.
- 2) If the fire is beyond control or there is a potential for explosion, all personnel should immediately evacuate the site.
- 3) Emergency fire department personnel should be contacted immediately. If the fire involves hazardous chemicals, the emergency responders must be informed of such.

**Chemical Spills (no injury)**

If a chemical spill occurs on site, the following steps should be taken:

- 1) If properly trained personnel with appropriate PPE are present, begin spill containment immediately.
- 2) Immediately report the spill to the Site Health and Safety Officer. The initial report shall include at least the following information:
  - Identify the person and their employer reporting the spill.
  - Type and description of released material.
  - Estimate amount of material released.
  - Extent of injury or property damage occurring.
  - Extent of actual or potential environmental damage if known.
  - Information concerning the spill reaching or potentially reaching the plant storm sewer system.
  - Identify the actions being taken in response to the spill.

- Identify the assistance required to respond to the spill.

**Incident Report Forms**

Incident response forms are included in Appendix A. These forms must be filled out and submitted to EnSafe in the event of an injury or spill, after the emergency response is complete and the situation is stabilized. In addition, a "Investigation Report" form is also provided and should be used where appropriate.

**Appendix C**  
**Site Specific Contacts**

**Emergency Telephone Numbers**

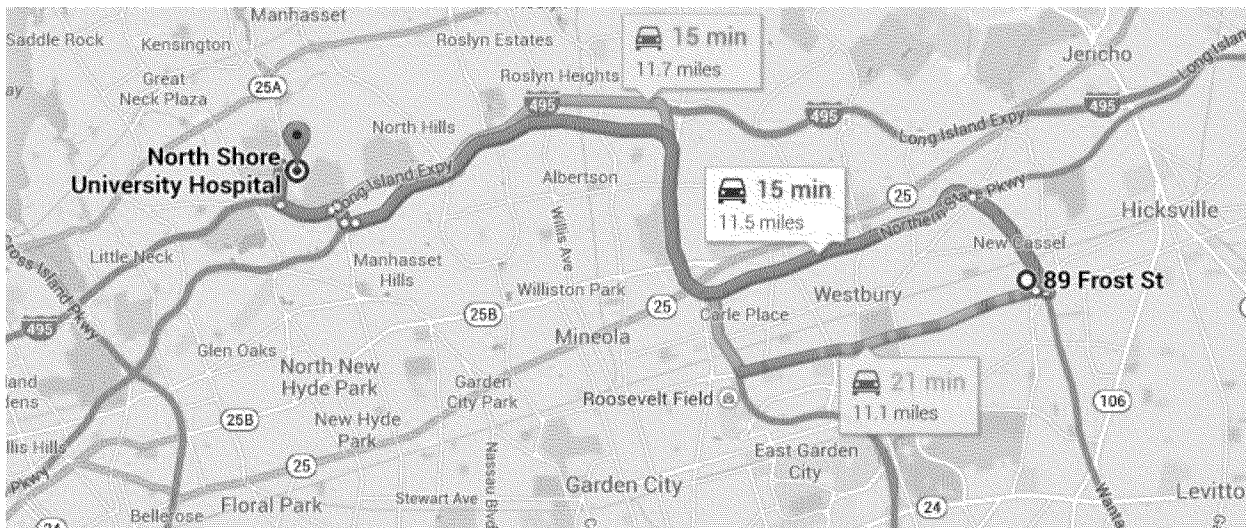
Ambulance — Westbury Fire Department	<b>Emergency 911</b>
Westbury Fire Department	<b>Emergency 911</b>
Nassau County Police Department	<b>Emergency 911</b>
Hospital — North Shore University Hospital - Manhasset	(516) 562-0100
Minor Medical Treatment — Premier Care of Carle Place	(866) 255-2381
National Capital Poison Center	(800) 222-1222

**Key Personnel Telephone Numbers**

<b>Title</b>	<b>Category</b>	<b>Data</b>
EnSafe Site Supervisor/H&S	Name	Alexandra Royko aroyko@EnSafe.com
	Work	(860) 665-1140 x6022
	Mobile	(401) 212-0149
EnSafe Project Manager	Name	Craig Wise cwise@EnSafe.com
	Work	(901) 937-4243
	Mobile	(901) 340-4789
EnSafe Corporate Health and Safety Manager	Name	John Knopf jknopf@EnSafe.com
	Work	(901) 937-4255
	Work (toll Free)	(800) 588-7962 x321
	Mobile	(901) 451-1464
EnSafe Health and Safety Specialist	Name	Eric Allen eallen@EnSafe.com
	Work	(901) 937-4281
	Mobile	(901) 359-6698

**Appendix D**  
**Emergency Medical Care Driving Directions**

**Primary Hospital Directions and Map**  
**North Shore University Hospital**  
**300 Community Drive, Manhasset, New York, 11030**  
**(516) 562-0100**



**Frost Street Site**

**89 Frost Street**

**Westbury, New York 11590**

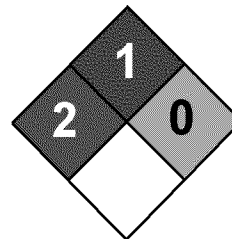
- Head south on Frost St toward Old Country Rd
- Turn left onto Old Country Rd
- Slight right onto the ramp to N Westbury
- Merge onto Wantagh State Pkwy
- Keep left at the fork, follow signs for Northern State Parkway W/New York and merge onto Northern State Pkwy
- Take exit 26N to merge onto New Hyde Park Rd toward N Hills
- Merge onto New Hyde Park Rd
- Turn left onto N Service Rd
- Slight right to stay on N Service Rd
- Turn right onto Community Dr
- Turn right

**North Shore University Hospital**

**300 Community Drive**

**Manhasset, New York 11030**

**Appendix E**  
**Biological and Chemical Hazards**



Health	2
Fire	1
Reactivity	0
Personal Protection	H

## Material Safety Data Sheet

### Trichloroethylene MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Trichloroethylene

**Catalog Codes:** SLT3310, SLT2590

**CAS#:** 79-01-6

**RTECS:** KX4560000

**TSCA:** TSCA 8(b) inventory: Trichloroethylene

**CI#:** Not available.

**Synonym:**

**Chemical Formula:** C<sub>2</sub>HCl<sub>3</sub>

#### Contact Information:

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

##### Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

**Toxicological Data on Ingredients:** Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse].  
DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:** Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

##### Potential Chronic Health Effects:

**CARCINOGENIC EFFECTS:** Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.

**MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

**Skin Contact:**

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** 420°C (788°F)

**Flash Points:** Not available.

**Flammable Limits:** LOWER: 8% UPPER: 10.5%

**Products of Combustion:** These products are carbon oxides (CO, CO<sub>2</sub>), halogenated compounds.

**Fire Hazards in Presence of Various Substances:** Not available.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:**

SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

## Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

**Storage:**

Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m<sup>3</sup>) from ACGIH. Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Not available.

**Taste:** Not available.

**Molecular Weight:** 131.39 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 86.7°C (188.1°F)

**Melting Point:** -87.1°C (-124.8°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.4649 (Water = 1)

**Vapor Pressure:** 58 mm of Hg (@ 20°C)

**Vapor Density:** 4.53 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 20 ppm

**Water/Oil Dist. Coeff.:** The product is equally soluble in oil and water; log(oil/water) = 0

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol, diethyl ether, acetone.

**Solubility:**

Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Not available.

**Incompatibility with various substances:** Not available.

**Corrosivity:**

Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** No.

## Section 11: Toxicological Information

**Routes of Entry:** Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

**Other Toxic Effects on Humans:** Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** Passes through the placental barrier in human. Detected in maternal milk in human.

**Special Remarks on other Toxic Effects on Humans:** Not available.

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are more toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Trichloroethylene : UN1710 PG: III

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

**Other Regulations:** OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

### Other Classifications:

#### WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

#### DSCL (EEC):

R36/38- Irritating to eyes and skin. R45- May cause cancer.

#### HMIS (U.S.A.):

**Health Hazard:** 2

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** h

#### National Fire Protection Association (U.S.A.):

**Health:** 2

**Flammability:** 1

**Reactivity:** 0

**Specific hazard:**

#### Protective Equipment:

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

## Section 16: Other Information

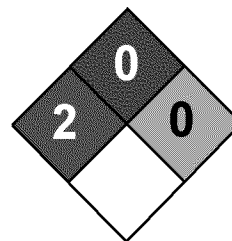
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 08:54 PM

**Last Updated:** 11/01/2010 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*



Health	2
Fire	0
Reactivity	0
Personal Protection	G

## Material Safety Data Sheet

### Tetrachloroethylene MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Tetrachloroethylene

**Catalog Codes:** SLT3220

**CAS#:** 127-18-4

**RTECS:** KX3850000

**TSCA:** TSCA 8(b) inventory: Tetrachloroethylene

**CI#:** Not available.

**Synonym:** Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolve; Tetrachloroethene; Tetraleno; Tetralox; Tetravec; Tetrogue; Tetropil

**Chemical Name:** Ethylene, tetrachloro-

**Chemical Formula:** C<sub>2</sub>-Cl<sub>4</sub>

#### Contact Information:

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

##### Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

**Toxicological Data on Ingredients:** Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

#### Section 3: Hazards Identification

##### Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

##### Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

#### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** Not applicable.

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:** Not available.

**Special Remarks on Explosion Hazards:** Not available.

#### Section 6: Accidental Release Measures

**Small Spill:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.

**Large Spill:**

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

#### Section 7: Handling and Storage

**Precautions:**

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

**Personal Protection:**

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 25 (ppm) from OSHA (PEL) [United States] TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States] TWA: 170 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Ethereal.

**Taste:** Not available.

**Molecular Weight:** 165.83 g/mole

**Color:** Clear Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 121.3°C (250.3°F)

**Melting Point:** -22.3°C (-8.1°F)

**Critical Temperature:** 347.1°C (656.8°F)

**Specific Gravity:** 1.6227 (Water = 1)

**Vapor Pressure:** 1.7 kPa (@ 20°C)

**Vapor Density:** 5.7 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 5 - 50 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in oil; log(oil/water) = 3.4

**Ionicity (in Water):** Not available.

**Dispersion Properties:** Not available.

**Solubility:**

Miscible with alcohol, ether, chloroform, benzene, hexane. It dissolves in most of the fixed and volatile oils. Solubility in water: 0.015 g/100 ml @ 25 deg. C It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, metals, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Oxidized by strong oxidizing agents. Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium, barium. Protect from light.

**Special Remarks on Corrosivity:** Slowly corrodes aluminum, iron, and zinc.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2629 mg/kg [Rat]. Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5200 4 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of ingestion.

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose/Conc: LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg LDL [Dog] - Route: Oral; Dose: 4000 mg/kg LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic). May cause cancer.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes skin irritation with possible dermal blistering or burns. Symptoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts. Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain. Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorientation, seizures, emotional instability, stupor, coma). It may cause pulmonary edema. Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation. Ingestion/Inhalation: Chronic exposure can affect the liver (hepatitis, fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/central nervous system/peripheral nervous system (impaired memory, numbness of extremities, peripheral neuropathy and other

## Section 12: Ecological Information

### Ecotoxicity:

Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fathead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

**BOD5 and COD:** Not available.

### Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

### Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Tetrachloroethylene UNNA: 1897 PG: III

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

### Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Tetrachloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene Connecticut hazardous material survey.: Tetrachloroethylene Illinois toxic substances disclosure to employee act: Tetrachloroethylene Illinois chemical safety act: Tetrachloroethylene New York release reporting list: Tetrachloroethylene Rhode Island RTK hazardous substances: Tetrachloroethylene Pennsylvania RTK: Tetrachloroethylene Minnesota: Tetrachloroethylene Michigan critical material: Tetrachloroethylene Massachusetts RTK: Tetrachloroethylene Massachusetts spill list: Tetrachloroethylene New Jersey: Tetrachloroethylene New Jersey spill list: Tetrachloroethylene Louisiana spill reporting: Tetrachloroethylene California Director's List of Hazardous Substances: Tetrachloroethylene TSCA 8(b) inventory: Tetrachloroethylene TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97 SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

#### WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

#### DSCL (EEC):

R40- Possible risks of irreversible effects. R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S23- Do not breathe gas/fumes/vapour/spray S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37- Wear suitable gloves. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

**HMIS (U.S.A.):****Health Hazard:** 2**Fire Hazard:** 0**Reactivity:** 0**Personal Protection:** g**National Fire Protection Association (U.S.A.):****Health:** 2**Flammability:** 0**Reactivity:** 0**Specific hazard:****Protective Equipment:**

Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Safety glasses.

**Section 16: Other Information****References:** Not available.**Other Special Considerations:** Not available.**Created:** 10/10/2005 08:29 PM**Last Updated:** 11/01/2010 12:00 PM

*The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.*

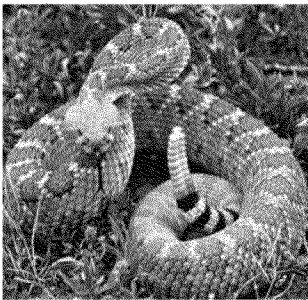
## Poisonous Snakes of the United States

### Coral Snake



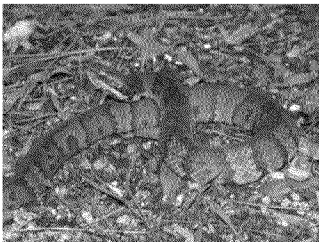
- There are 3 different species of coral snakes in North America.
- They range in size at adulthood from 1 foot to 3 feet in length.
- Remember the jingle, "Red and black, friend of Jack; red and yellow kill a fellow."

### Rattle Snake



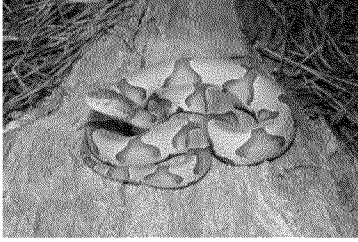
- There are 9 different species of rattlesnakes in North America.
- Found in all 48 lower states.
- They range in size at adulthood from 1 foot to 8 feet in length. The majority of rattlesnakes are between 2 and 3 feet in length.
- All have the signature rattlesnake design as a defense mechanism to keep predators away.

### Cotton Mouth (Water Moccasin)



- There are 4 species of cottonmouth and it is found in the Southeast United States into the boot heel of Missouri.
- They range in size at adulthood from 2 feet to 6 feet and are very aggressive.
- Prefers lowland wet areas and ditches.
- Signature white 'cotton colored' interior of mouth.

## Copperhead

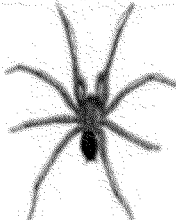
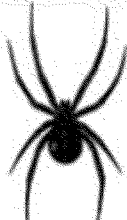
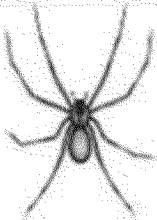


- There are 2 species of Copperhead.
- They reach a maximum size of 4 ½ feet in length.
- They are found in all areas of the United States except for the Pacific Northwest and California.
- Copperheads prefer wooded hillsides with rock outcrops above streams or ponds; edges of swamps.
- Signature 'copper' color.

POISONOUS SPIDERS OF THE UNITED STATES

# USA SPIDER CHART

## DEADLY & DANGEROUS



**BROWN RECLUSE SPIDER**

**BLACK WIDOW SPIDER**

**HOBO SPIDER**

### SPIDER BITE FIRST AID

Keep patient calm

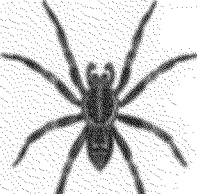
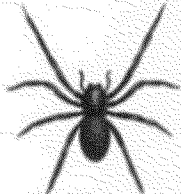
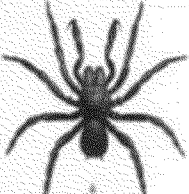
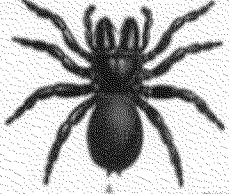
Apply ice to decrease pain and swelling

Use anti-inflammatories for pain relief

Contact your doctor

NOTICE: MALE SPIDERS HAVE A SMALLER ABDOMEN, LONGER LEGS & SWOLLEN PALPS (FOR REPRODUCTION)

## TOXIC (POISONOUS) — PAINFUL BITE



**FEMALE MOUSE SPIDER**  
ENLARGED HEAD & FANGS • DEEP PAINFUL BITE  
GROUND DWELLING — OFTEN MISTAKEN FOR FUNNEL WEB

**MALE MOUSE SPIDER**  
SMALL SPINNERETS


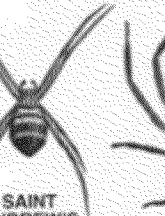
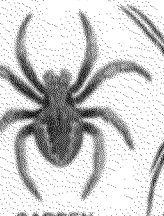

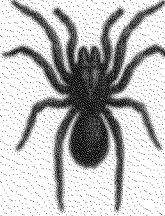
**BLACK HOUSE SPIDER**  
VENOMOUS • NAUSEA, SWEATING, ETC.  
OFTEN FOUND IN THEIR WEBS IN WINDOW FRAMES, EAVES, ETC.

**WOLF SPIDER**  
NON AGGRESSIVE  
GROUND DWELLING

WARNING: MOST OF THESE SPIDERS CAN BE DANGEROUS TO PEOPLE WITH ALLERGIES OR HYPER SENSITIVITIES

## THE "LOW RISK" SPIDERS

SPIDERS CAN BE BENEFICIAL IN THE CONTROL OF MOSQUITOES & FLIES • BUT IF THEY PRESENT A DANGER — CALL FLAMPEST



**FEMALE TRAP-DOOR**  
MILDLY TOXIC • NON AGGRESSIVE  
GROUND DWELLING (BURROW) — OFTEN WITHOUT ALGS

**MALE TRAP-DOOR**  
SWOLLEN PALPS

**GARDEN ORB-WEAVING**  
RELATIVELY HARMLESS • BENEFICIAL  
OFTEN SEEN IN A LARGE WEB IN THE GARDEN

**SAINT ANDREW'S CROSS**

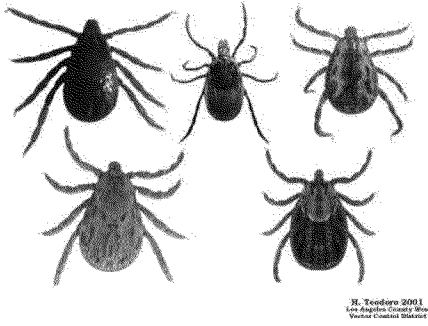
**HUNTSMAN**  
TEND • RARELY BITES  
FOUND UNDER LOOSE BARK  
MAY WANDER Indoors

Note: The Poisonous Spiders are at the top of the chart

ED\_001164\_00019908-00085

## OTHER BIOLOGICAL HAZARDS

### Ticks



- Ticks are blood-feeding parasites that are often found in tall grass and shrubs, where they will wait to attach to a passing host.
- Ticks pass a number of diseases including Lyme disease.
- Daily inspection of your body will reveal any ticks that can easily be removed.
- First Aid-Antiseptic ointment and observation of bite area.
- If bite area turns red or swells after a few days, seek medical attention.

### Rodents



- **Rats**
- **Mice**
- **Squirrels**
- **Chipmunks**
- **Muskrats**
- **Beavers**
- **Prairie Dogs**

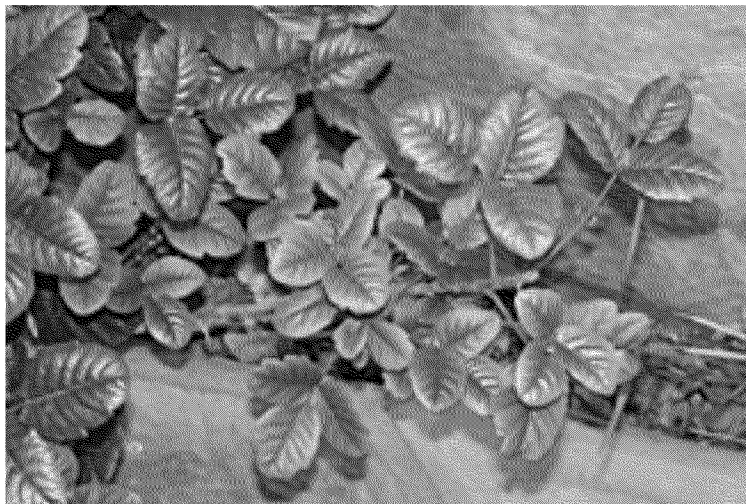
Rodents are disease carriers who can carry over 20 different diseases that are dangerous to humans. These diseases can be transmitted either through direct or indirect contact. While a rodent may seem like a small animal, you cannot underestimate their potential for harm. The best course of action is to avoid contact with them at all times. Should you become bitten or scratched by these disease carrying animals, seek medical attention immediately.

## Poison Ivy



The most common and well-known irritating plant in this area is poison ivy. It can grow as a groundcover or as a "hairy" vine climbing up the bark of trees. Skin contact with any part of the plant can result in an allergic response that causes itching red spots and blistering. Washing thoroughly with warm, soapy water can reduce the likeliness of a reaction if you have touched the plant.

## Poison Oak



The Poison Oak of the southeastern United States has its leaves divided into three leaflets; the leaflets are densely haired and generally have three to seven distinct lobes. The white, berry-like fruit are also somewhat hairy. Both species contain poisonous substances that are believed to be identical or closely related to that found in poison ivy.

## Poison Sumac



Poison Sumac is a small tree or large shrub with large attractive leaves and white fruit that could be used as an ornamental if it didn't cause severe skin irritation in most people. Its smaller relatives with 3-parted leaves, Poison Ivy and Poison Oak, have similar irritating properties.

Key features to identify it include are alternate leaves usually with 9-13 entire (not toothed) leaflets and a red rachis (the stem connecting the leaflets). The leaflets are smooth and may be shiny above.

**Appendix F**  
**Job Hazard Analyses**

# Job Hazard Analysis (JHA)

Activity/Work Task: <b>Hollow Stem Auger (HSA) Drilling and well installation</b>	Overall Risk Assessment Code (RAC) (Use highest code)					<b>M</b>
Project Location: Frost Street, Westbury, New York	<b>Risk Assessment Code (RAC) Matrix</b>					
Project Number: 0888811027	<b>Severity</b>	<b>Probability</b>				
Date Prepared: 9/16/2014		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Eric Allen, CSP/ H&S Specialist	Catastrophic	<b>E</b>	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>
	Critical	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>
Reviewed by (Name/Title): Alex Royko/ Site Supervisor	Marginal	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>L</b>
	Negligible	<b>M</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				<b>RAC Chart</b>	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				<b>E = Extremely High Risk</b>	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				<b>H = High Risk</b>	
					<b>M = Moderate Risk</b>	
						<b>L = Low Risk</b>
<b>Recommended PPE:</b> <input checked="" type="checkbox"/> Safety Glasses With Sideshields <input checked="" type="checkbox"/> Steel-Toed Boots <input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Nitrile Gloves <input type="checkbox"/> Leather Gloves <input checked="" type="checkbox"/> Hearing Protection <input type="checkbox"/> Flame Retardant Clothing						
<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>				<b>RAC</b>
General Physical Hazards	<ul style="list-style-type: none"> <li>Slip/Trip/Fall</li> <li>Cold/Heat Stress</li> <li>Biological Hazards</li> <li>Cuts/Scrapes/Bruises</li> <li>Manual lifting</li> </ul>	<ul style="list-style-type: none"> <li>Level D PPE required.</li> <li>Maintain a clean and organized work area.</li> <li>Watch your step and ensure proper footing.</li> <li>Provide drinking water and first aid kit.</li> <li>Wear appropriate clothing for weather conditions.</li> <li>Assess work area for poisonous plants and animals and communicate observations to avoid them.</li> <li>Wear appropriate work gloves for task</li> <li>Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance)</li> </ul>				<b>L</b>
	<ul style="list-style-type: none"> <li>Adverse Weather</li> </ul>	<ul style="list-style-type: none"> <li>Be aware of changing weather condition and provide appropriate weather gear.</li> <li>When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)</li> </ul>				

Job Steps	Hazards	Controls	RAC
Mobilization / Site Set Up	<ul style="list-style-type: none"> <li>Slips, Trips, Falls</li> </ul>	<ul style="list-style-type: none"> <li>Clear trees, roots, weeds, limbs and other ground hazards from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions, equipment, and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.</li> </ul>	<b>L</b>
	<ul style="list-style-type: none"> <li>General equipment hazards <ul style="list-style-type: none"> <li>Overhead and underground utilities</li> <li>Noise Hazard</li> <li>Pinch points/swing radius</li> <li>Chemical exposure potential</li> <li>Eye Injury</li> <li>Fire</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>All equipment will be properly secured during transport.</li> <li>All vehicles and equipment will comply with DOT requirements.</li> <li>Never move the hydraulic push rig with the mast upright. Ensure the sampling site foundation is stable and as level as possible.</li> <li>Use a ground guide along with a functioning back-up alarm during equipment backing.</li> <li>Confirm Utility Locations</li> <li>Inspect vehicles and equipment daily (Checklists provided in HASP)</li> <li>Maintain clean and organized work area.</li> <li>Wear appropriate clothing and PPE, (no loose clothing or jewelry)</li> <li>Earplugs and/or ear muffs required in EZ</li> <li>Position the drill rig and personnel up wind of drilling location</li> <li>Monitoring breathing zone with PID and upgrade PPE as required.</li> <li>Avoid creating splash hazards while drilling.</li> <li>Keep a safe distance from drill rig.</li> <li>Use hand signals, keep clear of moving equipment, and ensure eye contact with operator prior to approaching.</li> <li>Have fire extinguisher on site.</li> </ul>	
	<ul style="list-style-type: none"> <li>Contact with utilities</li> </ul>	<ul style="list-style-type: none"> <li>Inspect for buried and overhead utilities in the vicinity of the drilling location. Clearance will be required, as stipulated in the HASP.</li> </ul>	
	<ul style="list-style-type: none"> <li>Traffic in adjacent roadway</li> </ul>	<ul style="list-style-type: none"> <li>Use combination of vehicles, cones, traffic barriers, and caution tape</li> </ul>	
Boring Process	<ul style="list-style-type: none"> <li>Cuts</li> </ul>	<ul style="list-style-type: none"> <li>Wear appropriate work gloves to prevent cuts, lacerations</li> </ul>	<b>M</b>
	<ul style="list-style-type: none"> <li>Dermal Contact</li> </ul>	<ul style="list-style-type: none"> <li>Wear appropriate protective clothing to avoid dermal or personal clothing contact with sampled material.</li> </ul>	

Job Steps	Hazards	Controls	RAC
	<ul style="list-style-type: none"> <li>Slips, Trips, Falls</li> </ul>	<ul style="list-style-type: none"> <li>Clear trees, roots, weeds, limbs and other ground hazards from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.</li> </ul>	
	<ul style="list-style-type: none"> <li>Cuts/Scrapes</li> </ul>	<ul style="list-style-type: none"> <li>Inspect glassware for breakage and avoid sharp edges and wear gloves (nitrile and cut resistant leather or Kevlar)</li> </ul>	
	<ul style="list-style-type: none"> <li>Manual lifting of equipment</li> </ul>	<ul style="list-style-type: none"> <li>Use proper lifting techniques and do not over-extend</li> </ul>	
Rig decontamination	<ul style="list-style-type: none"> <li>High pressure water</li> <li>Splash Hazard</li> </ul>	<ul style="list-style-type: none"> <li>Spray away from body</li> <li>Wear full-face shield, gloves, rubber boots, and Tyvek or other suitable attire.</li> </ul>	L

Additional Safety Considerations
<ol style="list-style-type: none"> <li>1. Ensure all personnel have read the HASP</li> <li>2. Ensure all equipment is equipped with necessary fire extinguishers (min 5 lbs BC). Ensure equipment has a working kill switch and back-up alarms, and follow equipment inspection procedures.</li> <li>3. Ensure underground utilities are verified with facility, marked, markings maintained, and operator aware of location</li> <li>4. All equipment operators must be Competent Persons for the task/equipment being performed/operated.</li> <li>5. All ground personnel must stay clear of equipment and make eye contact (and receive confirmation) with operator prior to approaching. Wear high visibility reflective vests and stay out of travel lanes and swing radius of heavy equipment.</li> <li>6. Dust hazard are expected to be minimal due to saturated state of soils and regular precipitation. If visible emissions of dust observed, then dust suppression techniques will be implemented.</li> <li>7. Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.</li> <li>8. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks. Consult appropriate JHAs</li> <li>9. Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed of the truck. It can cause property damage or serious injuries by falling from vehicle.</li> <li>10. When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.</li> <li>11. Conduct equipment inspection of all hoses and switches. Stay clear of running equipment.</li> <li>12. Maintain good housekeeping practices. When possible, use mechanical equipment to perform lifting of heavy objects. When lifting, follow safe lifting practices. Use the buddy system when lifting.</li> <li>13. Stay clear of moving rig, do not move rig with mast raised, do not drive on slopes greater than 30 degrees, avoid soft areas when moving rig and setting up, chock wheels. Use spotter when moving rig, check for overhead obstructions.</li> <li>14. Wear nitrile gloves when collecting samples in soil to avoid dermal contact with potential contaminants. Be observant for tripping hazards, holes, stickups, vines, old fence wire, etc.</li> <li>15. For equipment decontamination, triple rinse using distilled or deionized water and alconox for first rinse and distilled or deionized water for second and third rinses. Always clean materials between locations and at the site. Do not bring equipment back to the office without proper decontamination.</li> </ol>

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Hollow Stem Auger Rig	Sampling to be performed by competent person as certified by employer.	Equipment will be inspected daily by HSA rig operator. Any safety deficiencies detected will require cessation of sampling activities until appropriate repairs have been made.

## Acknowledgement

All employees, subcontractors, and visitors must sign the Acknowledgement form, in this section, before conducting field activities at this site.

By signing this form, EnSafe, Inc. employees agree that:

- I have read this Job Hazard Analysis and I understand the requirements of the JHA.
- I will conduct work at this site in accordance with the requirements of the JHA.

By signing this form, subcontractors and visitors agree that:

- I have read and understood the potential hazards associated with the site.
- I will ensure compliance with my company's policies on health and safety.

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Print Name & Company

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature

# Job Hazard Analysis (JHA)

Activity/Work Task: <b>Work around excavation activities</b>		Overall Risk Assessment Code (RAC) (Use highest code)				<b>M</b>	
Project Location: Frost Street, Westbury, New York		<b>Risk Assessment Code (RAC) Matrix</b>					
Project Number: 0888811027		<b>Severity</b>	<b>Probability</b>				
Date Prepared: 9/16/2014			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Eric Allen, CSP/ H&S Specialist			<b>E</b>	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>
Reviewed by (Name/Title): Alex Royko/ Site Supervisor			<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>
			<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>L</b>
		<b>M</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>L</b>	
<b>Notes:</b> (Field Notes, Review Comments, etc.)		<p>Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)</p> <p><b>"Probability"</b> is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.</p> <p><b>"Severity"</b> is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible</p> <p>Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.</p>					
		<p><b>RAC Chart</b></p> <p><b>E = Extremely High Risk</b></p> <p><b>H = High Risk</b></p> <p><b>M = Moderate Risk</b></p> <p><b>L = Low Risk</b></p>					
<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>				<b>RAC</b>	
General Physical Hazards	<ul style="list-style-type: none"> <li>Slip/Trip/Fall</li> <li>Cold/Heat Stress</li> <li>Biological Hazards</li> <li>Cuts/Scrapes/Bruises</li> <li>Manual lifting</li> </ul>	<ul style="list-style-type: none"> <li>Level D PPE required.</li> <li>Maintain a clean and organized work area.</li> <li>Watch your step and ensure proper footing.</li> <li>Provide drinking water and first aid kit.</li> <li>Wear appropriate clothing for weather conditions.</li> <li>Assess work area for poisonous plants and animals and communicate observations to avoid them.</li> <li>Wear appropriate work gloves for task</li> <li>Maintain 3 points of contact when climbing into vehicle</li> <li>Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance)</li> </ul>				<b>L</b>	
	<ul style="list-style-type: none"> <li>Adverse Weather</li> </ul>	<ul style="list-style-type: none"> <li>Be aware of changing weather conditions and provide appropriate weather gear.</li> <li>When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)</li> </ul>					

Job Steps	Hazards	Controls	RAC
Excavation/ Trench Sampling Activities	<ul style="list-style-type: none"> <li>Struck By</li> <li>Caught Between</li> </ul>	<ul style="list-style-type: none"> <li>Never enter the swing radius of the backhoe or trackhoe while it is in operation.</li> <li>Make eye contact and use clear concise hand signals with the operator if you need to approach him/her.</li> <li>Do not approach the bucket until it is resting on the ground and the operator signals the all clear to enter the area.</li> </ul>	<b>M</b>
Work around open trench or excavation	<ul style="list-style-type: none"> <li>Fall</li> <li>Engulfment</li> </ul>	<ul style="list-style-type: none"> <li>Maintain <u>6</u> feet or greater of clearance from the edge of the trench or excavation at all times.</li> </ul>	<b>M</b>

Chemical Hazards and Monitoring Procedures	
<b>Chemical Hazard(s) (list):</b>	Tetrachloroethene and Trichloroethene
<b>Monitoring Instrument(s):</b>	N/A
<b>Applicable HASP Section(s):</b>	5.2

Additional Safety Considerations
<ol style="list-style-type: none"> <li>1. Ensure all personnel have read the HASP</li> <li>2. Ensure all equipment is equipped with necessary fire extinguishers (min 5 lbs BC).</li> <li>3. Follow safe driving procedures. Always use the buddy system when moving vehicles. Plan your travel path ahead of time. Use maps and known construction zones to make your selection. Consult with the other team members before making any changes to travel path.</li> <li>4. Use an equipment checklist to verify you have the appropriate equipment/tools for your tasks.</li> <li>5. Stow all materials in vehicle properly, use appropriate cases and bags. Secure equipment in bed of truck with netting or straps. Do not leave any equipment loose in the cab or bed of the truck. It can cause property damage or serious injuries by falling from vehicle.</li> <li>6. When securing equipment, watch for pinch points. Straps and netting can get caught on objects and snap back as well as trap a finger if hand placement is not correct. Use a buddy to help secure equipment when possible.</li> <li>7. Maintain good housekeeping practices. When possible, use mechanical equipment to perform lifting of heavy objects. When lifting, follow safe lifting practices. Use the buddy system when lifting.</li> <li>8. Wear nitrile gloves when collecting samples in soil to avoid dermal contact with potential contaminants. Be observant for tripping hazards, holes, stickups, vines, old fence wire, etc.</li> </ol>

Additional Operational Safety Procedures	PPE
	<p>LEVEL D</p> <ul style="list-style-type: none"> <li>ANSI approved hard hat</li> <li>ANSI approved safety glasses</li> <li>Shirts with sleeves and full-length pants.</li> <li>ANSI approved steel safety-toe boots or approved equivalent.</li> <li>High visibility reflective traffic vest if near moving vehicles</li> <li>Nitrile Gloves</li> <li>Leather work gloves</li> </ul>

	<ul style="list-style-type: none"> <li>• First aid kit (located in vehicle).</li> <li>• Fire extinguisher (located in vehicle).</li> </ul> <p>Level C (As necessary by SSO)</p> <ul style="list-style-type: none"> <li>• Half face respirator with a P100 filter. (Consult Corporate H&amp;S prior to upgrade)</li> </ul>
--	---

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Backhoe/ Trackhoe	TBD/Contractor	Daily equipment inspection must be conducted and recorded by the contractor.
Dump Truck	CLD/Contractor	Daily equipment inspection must be conducted and recorded by the contractor.

Physical Task Requirements		
<b>Please answer for the task being analyzed:</b>		
<b>Yes</b>	<b>No</b>	
<b>X</b>		Ability to wear tight-fitting face pieces (negative pressure respirators).
<b>X</b>		Ability to lift over 40 pounds.

**Appendix B**  
**Community Air Monitoring Plan**

## Appendix 1A

### New York State Department of Health Generic Community Air Monitoring Plan

#### Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

#### Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

**Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

**Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

#### VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

#### Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{mcg}/\text{m}^3$ ) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed  $150 \text{ mcg}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than  $150 \text{ mcg}/\text{m}^3$  above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \text{ mcg}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

**Appendix C**  
**Quality Assurance Project Plan**

## **QUALITY ASSURANCE PROJECT PLAN (QAPP)**

### **1.0 PROJECT ORGANIZATION AND RESPONSIBILITIES**

Walden maintains company policies and procedures to ensure that samples collected and any analytical analyses performed are completed with a high degree of quality. These policies and procedures ensure confidence that the resulting data represent the matrix being sampled. Quality Assurance/Quality Control (QA/QC) starts with the design of the sampling program and ends with the summarized analytical data submitted in the final report. This Quality Assurance Project Plan (QAPP) describes all of these policies and procedures. Specific details of the work to be performed at the site are provided in the *Supplemental Source Area Remedial Investigation Work Plan for 89 Frost Street* (dated February 8, 2011).

The project Quality Assurance Officer (QAO) shall be Ms. Jennifer Pilewski. The QAO is responsible for ongoing surveillance of project activities, ensuring conformance to this QAPP, and evaluating the effectiveness of the QAPP requirements. The QAO will have access to all personnel and subcontractors, as necessary, to resolve technical problems and take corrective action as appropriate. The QAO has the authority to recommend that work be stopped when the quality of the work appears to be in jeopardy. The QAO will be available to respond to immediate QA/QC problems. The primary QAO responsibilities are as follows:

- Monitor the correction of QC problems and alert task leaders to situations where similar problems might occur.
- Develop and maintain project QA files for sampling, monitoring, and field QA records.
- Participate in QA audits.
- Recommend changes to the project manager to improve the effectiveness of the project in attaining its QA objectives for field sampling and monitoring activities.
- Review proposed additions and changes to this QAPP.

Project QA will be maintained under the direction of Ms. Jennifer Pilewski, in accordance with this QAPP.

QC for specific tasks will be the responsibility of Walden and its subcontractors, which shall be selected at the time the work is required under the direction of Ms. Jennifer Pilewski.

## **2.0 QUALITY ASSURANCE PROJECT PLAN OBJECTIVES**

### **2.1 OVERVIEW**

Overall project goals are defined by developing Data Quality Objectives (DQOs), which are qualitative and quantitative statements that specify the quality of the data required to support decision-making. Data quality is measured by how well the data meet the project QA/QC goals. In this QAPP, "Quality Assurance" and "Quality Control" are defined as follows:

- Quality Assurance - The total integrated program to assure the reliability of monitoring and measurement data.
- Quality Control - The routine application of procedures to obtain prescribed standards of performance in the monitoring and measurement process.

### **2.2 QA/QC REQUIREMENTS**

QA elements to be evaluated include accuracy, precision, sensitivity, representativeness, and completeness. Data reporting must be clear, concise and comprehensive. The data generated by the analytical laboratory for this project are required to be sensitive enough to achieve detection levels low enough to meet Contract Required Quantitation Limits (CRQLs) as specified in NYSDEC Analytical Services Protocol (NYSDEC ASP, updated 7/05) for Superfund CLP and EPA SW-846 methods performed in accordance with NYSDEC ASP protocol. The analytical results meeting the CRQLs will provide data sensitive enough to meet the cleanup level objectives of this investigation as described in the work plan. The QC elements that are important to this project are blank contamination, instrument calibration, field data completeness, sample holding times, sample preservation, and sample custody.

#### **2.2.1 Initial Instrument Calibration**

Calibration curves will be developed for each of the compounds to be analyzed. Standard concentrations and a blank will be used to produce the initial curves. The development of calibration curves and initial calibration response factors must be consistent with method requirements presented in the most recent version of NYSDEC ASP (7/05).

### **2.2.2 Continuing Instrument Calibration**

The initial calibration curve will be verified every 12 hours by analyzing one calibration standard. The standard concentration will be the midpoint concentration of the initial calibration curve. The calibration check compound must come within 25% relative percent difference (RPD) of the average response factor obtained during initial calibration. If the RPD is greater than 25%, then corrective action must be taken as provided in the specific methodology.

### **2.2.3 Method Blanks**

The method blank or preparation blank is prepared from an analyte-free matrix, which includes the same reagents, internal standards and surrogate standards as the related samples. It is carried through the entire sample preparation and analytical procedure. A method blank analysis will be performed once for each 12-hour period during the analysis of samples for VOCs and once for each batch of samples for SVOCs and metals. An acceptable method blank will contain less than five (5) times the CRQL of methylene chloride, acetone, 2-butanone, and phthalate esters. For all other target compounds, the method blank must contain less than or equal to the CRQL of any single target compound. For non-target peaks in the method blank, the peak area must be less than 10% of the nearest internal standard. The method blank will be used to demonstrate the level of laboratory background and reagent contamination that might result from the analytical process itself.

### **2.2.4 Trip Blanks**

Trip blanks consist of a single set of sample containers filled at the laboratory with deionized, laboratory-grade water. The water used will be from the same source as that used for the laboratory method blank. The containers will be carried into the field and handled and transported in the same way as the samples collected that day.

Analysis of the trip blank for VOCs is used to identify contamination from the air, shipping containers, or from other items coming in contact with the sample bottles. (The bottles holding the trip blanks will be not opened during this procedure.) A complete set of trip blanks will be provided with each shipment of samples to the certified laboratory.

### **2.2.5 Duplicates**

Duplicate samples are two or more samples considered to be representative sub-samples of the

same source. The samples are identically processed throughout the measurement system. A field duplicate (blind duplicate) will be analyzed for the appropriate parameters. Laboratory duplicate analyses will be performed on liquid and solid matrices at a rate of one for every batch of field samples. Duplicate samples will be analyzed for TAL constituents. Duplicate analyses for TCL compounds will be associated with matrix spike and matrix spike duplicate analyses. The results of the duplicate analyses will be used to assess the precision of the measurement systems.

#### **2.2.6 Surrogate Spike Analysis**

Surrogate standard determinations will be performed on all samples and blanks analyzed by the analytical laboratory. All samples and blanks will be spiked with the appropriate surrogate compounds (as indicated by the methodology) before purging or extraction in order to monitor sample preparation and analyses. Surrogate spike recoveries shall fall within the advisory limits in accordance with the NYSDEC ASP protocols for samples falling within the quantitation limits without dilution.

#### **2.2.9 Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank (MS/MSD/MSB) Analysis**

MS, MSD and MSB analyses will be performed to evaluate the matrix effect of the sample upon the analytical methodology along with the precision of the instrument by measuring recoveries. The MS/MSD/MSB samples will be analyzed for each group of samples of a similar matrix, at a rate of one for every batch of field samples. The RPD will be calculated from the difference between the MS and MSD.

Matrix spike blank analysis will be performed to indicate the appropriateness of the spiking solution(s) used for the MS/MSD.

### **2.3 ACCURACY**

Accuracy is defined as the nearness of the mean ( $\bar{x}$ ) of a set of results to the true value. Accuracy is assessed by means of reference samples and percent recoveries. Accuracy includes both precision and recovery and is expressed as percent recovery (% REC). The MS sample is used to determine the percent recovery. The matrix spike percent recovery (% REC) is calculated by the following equation:

$$\% \quad REC = \frac{SSR - SR}{SA}$$

where:

SSR = measurement from spiked sample  
 SR = measurement from un-spiked sample  
 SA = actual data of spike added

## 2.4 PRECISION

Precision is defined as the measurement of agreement of a set of replicate results among themselves without assumption of any prior information as to the true result. Precision is assessed by means of duplicate/replicate sample analyses.

Analytical precision is expressed in terms of RPD. The RPD is calculated using the following formula:

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2) / 2}$$

where:

RPD = relative percent difference  
 D<sub>1</sub> = larger sample value  
 D<sub>2</sub> = smaller sample value (duplicate)

## 2.5 SENSITIVITY

The sensitivity objectives for this QAPP require that data generated by the analytical laboratory achieve detection levels low enough to meet the CRQLs specified by NYSDEC ASP. The method detection limits (MDL) for target compounds and target analyses will be established by the analytical laboratory to be well below the remedial objectives. The laboratory will submit

appropriate documentation to Walden as required by the QAO.

## **2.6 REPRESENTATIVENESS**

Representativeness is a measure of the relationship of an individual sample taken from a particular site to the remainder of that site and the relationship of a small aliquot of the sample (i.e., the one used in the actual analysis) to the sample remaining on site. A blind duplicate is used to accomplish this task, as well as to assess the precision of the data. Two identical soil samples will be collected from one boring and submitted as different samples. The RPD between the two samples should be between 25% and 50%. The use of standardized techniques and statistical sampling methods influences the representativeness of an aliquot of sample to the sample at the site. The representativeness of samples is assured by adherence to sampling procedures presented in the *Supplemental Source Area Remedial Investigation Work Plan for 89 Frost Street* (dated February 8, 2011).

## **2.7 COMPLETENESS**

Completeness is a measure of the quantity of data obtained from a measurement system as compared to the amount of data expected from the measurement system. Completeness is defined as the percentage of all results that are not affected by failing QC qualifiers, and should be between 70% and 100% of all analyses performed. The objective of completeness in laboratory reporting is to provide a thorough data support package. The laboratory data package provides documentation of sample analysis and results in the form of summaries, QC data, and raw analytical data. The laboratory will be required to submit data packages that follow NYSDEC ASP reporting format, which, at a minimum, will include the following components:

1. All sample chain-of custody forms.
2. The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
3. Documentation demonstrating the laboratory's ability to attain the contract specified detection limits for all target analyses in all required matrices.
4. Tabulated target compound results and tentatively identified compounds.

5. Surrogate spike analysis results (organics).
6. Matrix spike/matrix spike duplicate/matrix spike blank results.
7. QC checks sample and standard recovery results.
8. Spike sample results (inorganics).
9. Blank results (field, trip, and method).
10. Internal standard area and RT summary.

## **2.8 COMPARABILITY**

Comparability is the degree to which analytical data generated from an individual laboratory can be compared with those from another laboratory, in terms of use of standardized industry methods and equivalent instrumentation techniques. No laboratory split samples are expected to be taken for this project.

### **3.0 CALIBRATION AND MAINTENANCE PROCEDURES FOR FIELD EQUIPMENT**

Walden follows manufacturer's recommendations and guidelines with regard to field instrument calibration procedures. The calibration of each instrument will be checked prior to each day's use. The date and time of the calibration check, instrument serial and model number, and signature of the calibrating technician will be entered into the field logbook and within the instrument specific calibration log. If the instrument readings are incorrect, the instrument will be either recalibrated by the technician or returned to Walden's office where it will be further evaluated and/or repaired. If field instruments require major overhauls, the instruments will be returned to the manufacturer.

Preventive maintenance of field equipment is performed routinely before each sampling event. More extensive maintenance is performed based on hours of use. The Walden equipment coordinator has overall responsibility for the preventive maintenance program. However, certain maintenance programs are also overseen by the project manager. Manually operated sampling equipment is routinely checked to ensure that it operates properly and that excessive wear has not occurred. If necessary, equipment is taken out of service for repair or replacement.

## **4.0 SAMPLE CUSTODY**

### **4.1 OVERVIEW**

Sample handling in the field and in the laboratory will conform to the sample custody procedures presented in this section. Field custody procedures involve proper sample identification, chain-of-custody forms, and packaging and shipping procedures. Laboratory custody begins with the receipt of samples at the laboratory and continues through sample storage, analysis, data reporting, and data archiving. This section provides the procedures that will be followed during the course of the project to ensure proper sample custody.

### **4.2 FIELD CUSTODY PROCEDURES FOR OFF-SITE LABORATORY**

The following elements are important for maintaining the field custody of samples:

- Sample identification
- Sample labels
- Custody records
- Shipping records
- Packaging procedures

Sample labels will be attached to all sampling bottles before field activities begin. The sample labels will contain the site name, Walden job number, sample location and identification, date, time, sampler's initials, and the parameter(s) for analysis. Approximate sampling locations will be marked on a map with a description of the sample location. The number, type of sample, and sample identification will be entered into the field logbook.

A chain-of-custody form, initiated at the analytical laboratory, will accompany the sample bottles from the laboratory into the field. Upon receipt of the bottles and cooler, the sampler will sign and date the first "Received" blank space. After each sample is collected and appropriately identified, entries will be made on the chain-of-custody form that include:

- Site name and address
- Samplers' names and signatures
- Names and signatures of persons involved in chain of possession
- Sample number

- Number of containers
- Sampling station identification
- Date and time of collection
- Type of sample and the analyses requested
- Preservatives used (if any)
- Pertinent field data (pH, temperature, turbidity, etc.)

After sampling has been completed, the samplers will return/ship the samples to the laboratory. The sampler will sign and date the next "Relinquished" blank space. One copy of the custody form will remain in the field and the remaining copies will accompany the samples to the laboratory. The laboratory will receive all samples within 24 hours of collection. Samples will be received by laboratory personnel, who will assume custody of the samples and sign and date the next "Received" blank.

#### **4.3 LABORATORY CUSTODY PROCEDURES**

Upon receipt by the analytical laboratory, samples will proceed through an orderly processing sequence specifically designed to ensure continuous integrity of both the sample and its documentation.

All samples will be received by the laboratory's sample control group and will be carefully checked for label identification and completed accurate chain-of-custody records. The sample will be tracked from storage through the laboratory system until the analytical process is completed and the sample is returned to the custody of the sample control group for disposal. Generally, access to NYSDOH ELAP certified laboratories is restricted to prevent any unauthorized contact with samples, extracts, or documentation.

## **5.0 SAMPLE PREPARATION/ANALYTICAL PROCEDURES**

Containers, preservation and holding times of environmental samples will be applied as detailed in the NYSDEC ASP (updated 7/05). The holding time of samples for VOC analysis of all matrices will be seven (7) days from the verified time of sample receipt (VTSR) and five (5) days for SVOC analyses.

Soil samples analyses will be performed by the protocol requirements of the NYSDEC ASP (updated 7/05). Organic contaminants will be analyzed by NYSDEC ASP Superfund CLP Method 95-1 (OLM 04.2 List).

If any modifications or additions to the standard procedures are anticipated, and if any nonstandard sample preparation or analytical protocols are to be used, the modifications and the nonstandard protocol will be explicitly defined and documented.

Prior approval by Walden's QAO is required for any nonstandard analytical or sample preparation protocol used by the laboratory, i.e., dilution of samples or extracts by greater than a factor of 5.

## **6.0 DATA REDUCTION, VALIDATION, REVIEW, AND REPORTING**

### **6.1 OVERVIEW**

The process of data reduction, review, and reporting ensures that assessments or conclusions based on the final data accurately reflect actual site conditions. This plan presents the specific procedures, methods, and format that will be employed for data reduction, review, and reporting of each measurement parameter determined in the laboratory and field. Also described in this section is the process by which all data, reports, and work plans are proofed and checked for technical and numerical errors prior to final submission.

### **6.2 DATA REDUCTION**

Data reduction is the process by which raw analytical data generated from the laboratory instrument systems are converted into usable mass concentrations. The raw data, which may take the form of summation of areas under the instrument curve responses, or observations, is processed by the laboratory and converted into concentrations expressed in ug/kg for soil samples and ug/l for water samples. The analytical laboratory will be required to follow ASP data reduction procedures.

Data reduction also includes the process by which raw field data are summarized in tables and graphs, from which quantitative or qualitative assessments can be derived by filter integration and evaluation.

Field data obtained during sampling is summarized on appropriate field forms. This information will be used to assess field conditions at the time of sampling and is summarized and analyzed along with the chemistry data in the final report. Occasionally, the reduction of actual field data requires correcting measurement data for the measurement system's baseline value. The data will be adjusted only after the raw data has been submitted to Walden's QAO and prior to final report preparation.

### **6.3 VALIDATION**

The purpose of data validation is to define and document analytical data quality and determine whether the laboratory data quality is sufficient for the intended use(s) of the data. Data validation is the systematic process by which data quality is determined with respect to data quality criteria that are defined in project and laboratory QC programs and in the referenced

analytical methods. The data validation process consists of an assessment of the acceptability or validity of project data with respect to stated project goals and requirements for data usability. Ideally, data validation establishes the data quality in terms of project DQOs. Data validation consists of data editing, screening, checking, auditing, certification, review, and interpretation.

An approved independent data validator will review data (submitted to the off-site laboratory for confirmatory analyses) prior to its use in reports prepared by Walden. The validator will review the data in accordance with the following document: "Functional Guidelines for Evaluating Inorganic Analyses" and the "Functional Guidelines for Evaluating Organic Analyses" (Technical Directive Document No. HQ-8410-01, USEPA). The validator will evaluate the analytical laboratory's ability to meet the DQOs provided in this QAPP. Non-compliant data will be flagged in accordance with NYSDEC ASP and corrective action will be undertaken to rectify any problems.

The independent data validator will review the data for compliance by performing the following tasks:

***Task I: Determine Data Completeness***

Each data package will be reviewed for completeness. At a minimum, a complete data package will contain the following components:

- All sample chain-of-custody forms.
- The case narrative(s) presenting a discussion of any problems and/or procedural changes required during analyses. Also presented in the case narrative are sample summary forms.
- QA/QC summaries.
- All relevant calibration data summaries.
- Instrument and method performance data.
- Documentation demonstrating the laboratory's ability to attain the contract specified method detection limits for all target analyses in all required matrices.

If during the review process it is found that deficiencies exist in the data package, the analytical laboratory will be contacted and given 10 calendar days to produce the documentation needed to remove these deficiencies.

## ***Task II: Determine Data Compliance***

Each data package will be reviewed to determine compliance with those portions of this QAPP that pertain to the production of laboratory data. Compliance is defined by the following criteria:

- The data package is complete as defined in Task I above.
- The data have been produced and reported in a manner consistent with the requirements of this plan and the laboratory subcontract.
- All protocol-required QA/QC criteria have been met.
- All instrument calibration requirements have been met for the timeframe during which the analyses were completed.
- All protocol-required initial and continuing calibration summaries have been presented.
- All data reporting forms are complete for all samples submitted. This includes all requisite flags, all sample dilution/concentration factors, and all pre-measurement sample cleanup procedures.
- All problems encountered during the analytical process have been reported in the case narrative along with any and all actions taken by the laboratory to correct these problems.
- Verifying that calibration procedures were followed
- Verifying that data are reported in correct units
- Checking 10% of all field calculations
- Verifying that samples were properly shipped with the appropriate chain-of-custody documentation
- Verifying that QC samples were prepared and taken

Walden's QAO will perform further review of such data prior to data integration and evaluation. All assigned data reduction or analytical procedures will be verified for accuracy and content by at least two professionals qualified and experienced in evaluating the particular technical specialty.

## **6.4 WALDEN DATA REVIEW**

### **6.4.1 Laboratory Data**

The QAO or a designee under the project manager's supervision will review each analytical data package before it is submitted to the independent data validator, for completeness (i.e., *have all the analyses requested been performed?*) and general protocol compliance, such as holding times, detection limits, spike recoveries, and surrogate recoveries. The results of this review will be summarized and submitted to the independent validator with the data package. If information is found to be missing from the data package the analytical laboratory will be contacted and requested to submit any missing information.

### **6.4.2 Usability Report**

Upon completion of data validation, Walden's QAO will perform a data usability analysis on all analytical laboratory data. Taking into account protocols for sampling, transport, analysis, reduction, reporting, and the data validation report, the QAO will use this information and his/her own experience to establish whether the results of each analysis can be used for the purpose intended. The QAO will determine whether the final results can be used as reported, qualified to indicate limitations, or rejected outright.

## **6.5 REPORTING**

### **6.5.1 Field Data Reporting**

All field real-time measurements and observations will be recorded in project logbooks or field data records. Field measurements will include FID/PID results. All data will be recorded directly and legibly into field logbooks, with all entries signed and dated. If entries are changed, the change will not obscure the original entry. The reason for the change will be stated, and the correction and explanation will be signed and dated at the time the correction is made. Field data records will be organized into standard formats whenever possible, and retained in permanent files.

### **6.5.2 Laboratory Data Reporting**

All sample data packages submitted by the analytical laboratory will be required to be reported in conformance to the NYSDEC ASP (7/05) Superfund-CLP, Category B or Category A deliverable requirements as applicable to the method utilized for the confirmatory VOC analyses.

### **6.6 DATA USAGE**

The data will be used to support the evaluation of proposed modifications to the existing soil vapor extraction/air sparge (SVE/AS) remedial system located at the Frost Street Sites.

## **7.0 INTERNAL QUALITY CONTROL**

### **7.1 OVERVIEW**

QC checks will be performed to ensure the collection of representative and valid data. Internal QC refers to all data compilation and contaminant measurements. QC checks will be used to monitor project activities to determine whether QA objectives are being met. All specific internal QC checks to be used are identified in this section.

### **7.2 LABORATORY QUALITY CONTROL**

The analytical laboratory is required to exercise internal control in a manner consistent with the requirements of this plan. Control checks and internal QC audits are required by the NYSDEC ASP methods. These include reference material analysis, blank analysis, MS/MSD analysis, cleanups, instrument adjustments and calibrations, standards, and internal audits.

One qualified professional will proof and check all final reports for transcription and/or calculation errors. Twenty percent of all final reports will be subsequently checked again by a qualified professional. All data tables will be checked to ensure that no transcription errors have occurred. Data tables will also be checked to ensure that any criteria cited for comparison purposes is appropriate and correctly referenced. All calculations will be checked to ensure that they will be properly presented and that resulting values are achievable. If any results cannot be duplicated the calculations will be independently checked for accuracy.

## **8.0 PERFORMANCE AND SYSTEMS AUDITS**

Performance audits may be used to monitor project activities to assure compliance with project DQOs. The following text summarizes the field audits that may be conducted periodically.

### **8.1 FIELD AUDITS**

Walden periodically conducts internal audits of field activities. The Walden on-site project manager will routinely monitor all field activities to ensure that work is done correctly. All sampling and analytical work will be reviewed routinely by the project manager. All data sheets obtained in the field will be initialed and dated by project manager after review and acceptance of the services performed.

A field audit will include monitoring and evaluation of sample collection, sample holding times, preservation techniques, field QC, and equipment calibration. These audit forms will be kept on file with the Walden project manager for one year after completion of the project, then will be transferred to storage and held for an additional five years.

## **9.0 ANALYTICAL CORRECTIVE ACTION**

### **9.1 LABORATORY CORRECTIVE ACTION**

Corrective actions will be implemented if unsatisfactory performance and/or system audit results indicate that problems exist. Corrective action may also be implemented if the result of a data assessment or internal QC check warrants such action.